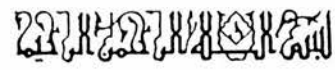


**A LANDSCAPE BRIEF FOR EGYPTIAN DESERT NEW TOWNS**

**Mostafa Mohamed Gabr**

**PhD Thesis  
Department of Landscape Architecture  
University of Edinburgh  
March 1990**





In the name of Allah the most Compassionate the most Merciful

TO MY PARENTS AND MY FAMILY



## **DECLARATION**

This thesis has been composed by myself and is my original work.

Mostafa Mohamed Gabr

## **ABSTRACT**

### **A landscape brief for Egyptian desert new towns**

The Egyptian government, faced with major problems of runaway population increases and very limited agricultural land has emphasised the importance of siting new urban expansion in desert areas rather than the Nile Valley. A new town development programme has been set up by the government to achieve this. Five new towns are now in the second stage of their development. Most of these towns however lack a proper understanding and application of landscape principles and concepts compatible with environmental dictates.

The present study was directed, therefore, to examining this deficiency. It consists of four parts. The first provides relevant background on Egypt and the problems of its new towns, and examines the landscape factors that have shaped the recent E.N.T. sites. The second part presents two case studies of typical new towns in order to elucidate the extent to which a landscape brief was identified and expressed in the final plans. This part draws on the work of a three months period of field study. Part three considers in more detail the emphasis necessary to relate physical structure and social aspect to the traditional environment. Finally, part four presents ideas for an appropriate landscape for urban expansion in the Egyptian desert.

## ACKNOWLEDGEMENTS

First and foremost, praise be to Allah Almighty for his kind and generous help throughout, hoping that He might accept this humble effort pure for His sake, and may His peace and blessings be upon His prophet Muhammad.

I am very grateful to Dr. J. Byrom for his encouragement, sustained interest and good advice. His advice to me to join the Landscape course has benefited me tremendously and added a whole new dimension to my work.

I wish also to express my gratitude to Mr. S. Filor for his advice at the preliminary stages of this study. I would like to thank also Professor C. Wilson and all the staff of the Architecture Department for their encouragement and advice.

Mrs. Morrison and Miss Scott have helped a great deal with library resources; my thanks are due to them for their kindness and help. My thanks are also due to Miss Lindsay Riddick for her immaculate work and excellent service during the typing of this thesis. I would like also to extend my thanks to my colleagues (postgraduate students) at the Department of Architecture, Edinburgh University for the warm and friendly atmosphere as well as for the fruitful discussions related to our studies.

In Egypt, I am indebted to many people and officials for their assistance in providing resources and information necessary for this study. I wish to express my thanks to the Egyptian government for the grant which enabled this work to be carried out.

My family at home in Egypt as well as my wife and children here have all been patient and supportive at a time when they themselves needed my support. I pray to Allah **Almighty** to reward them as well as every one of my friends who helped me.

Amen

## CONTENTS:

|                  | Page |
|------------------|------|
| ABSTRACT         | i    |
| ACKNOWLEDGEMENTS | ii   |
| CONTENTS         | iii  |

## PART I

### CHAPTER 1: A **SYNOPTIC** VIEW OF EGYPT

|     |                                     |    |
|-----|-------------------------------------|----|
| 1.1 | INTRODUCTION                        | 1  |
| 1.2 | SOCIO-ECONOMIC DATA                 | 3  |
| 1.3 | HISTORY                             | 8  |
| 1.4 | EGYPT'S ENVIRONMENT ON THE BRINK    | 16 |
| 1.5 | THE MAIN PROBLEMS                   | 17 |
| 1.6 | NATIONAL DEVELOPMENT PLAN FOR EGYPT | 28 |
| 1.7 | SCOPE OF THE RECENT PLAN            | 32 |
| 1.8 | THE IMPORTANCE OF THE STUDY         | 41 |

### CHAPTER 2: REGIONAL LANDSCAPE FACTORS

|     |  |     |
|-----|--|-----|
|     | INTRODUCTION   | 47  |
| 2.1 | GEOLOGY  | 48  |
| 2.2 | HYDROLOGY  | 65  |
| 2.3 | SOIL   | 83  |
| 2.4 | CLIMATE  | 95  |
| 2.5 | ARID PLANTS  | 108 |
| 2.6 | WILDLIFE   | 116 |
| 2.7 | ECOLOGY OF DESERT AREAS                                  | 123 |
| 2.8 | HUMAN SOCIAL FACTORS                                     | 135 |
| 2.9 | AN EXAMPLE OF A TYPICAL VERNACULAR DESERT LANDSCAPE TYPE | 145 |

## PART II

### CHAPTER 3. A LANDSCAPE BRIEF FOR EGYPTIAN NEW TOWNS

|   |     |
|---|-----|
| INTRODUCTION                                  | 170 |
| CASE STUDY I - 10TH OF RAMADAN                | 179 |
| R.3.1 LANDSCAPE FEATURES OF 10TH OF RAMADAN   | 179 |
| R.3.1.1 SITE ASSESSMENT                       | 179 |
| a) SOCIOECONOMIC DATA                         | 179 |
| b) LANDSCAPE AND ECOLOGICAL FACTORS           | 183 |
| c) VISUAL APPEARANCE                          | 191 |
| R.3.1.2 LANDSCAPE CONCEPT                     | 195 |
| CASE STUDY II - SADAT CITY                    | 210 |
| S.3.1 LANDSCAPE FEATURE OF SADAT CITY         | 210 |
| S.3.1.1 SITE ASSESSMENT                       | 210 |
| a) SOCIOECONOMIC DATA                         | 210 |
| b) LANDSCAPE AND ECOLOGICAL FACTORS           | 214 |
| c) VISUAL APPEARANCE                          | 220 |
| S.3.1.2 LANDSCAPE CONCEPT                     | 220 |
| 3.2 EVALUATION                                | 236 |
| 3.2.1 BUILT FORM                              | 236 |
| URBAN FORM                                    | 238 |
| OPEN SPACE                                    | 255 |
| 3.2.2 PLANTING                                | 266 |
| MAIN CONCEPT                                  | 266 |
| PLANTING DESIGN CHARACTERISTICS               | 274 |
| PLANT SELECTION                               | 283 |
| PLANTING OBJECTIVE                            | 291 |
| 3.2.3 WATER                                   | 297 |
| 3.2.3.1 WATER AS A GENERAL LANDSCAPE FACTOR   | 297 |
| 3.2.3.2 WATER AS A DETAILED LANDSCAPE ELEMENT | 304 |

|            |  |     |
|------------|--|-----|
| 3.2.4      | LANDFORM   |     |
|            | IDENTITY OF THE SITE   | 312 |
|            | VISUAL CHARACTERISTICS   | 313 |
|            | URBAN MASS AND LANDFORM  | 316 |
| 3.4        | LANDSCAPE PROCESS  | 321 |
|            | DEPARTMENTAL STRUCTURE   | 321 |
|            | DESIGN PROCESS   | 324 |
|            | ESTABLISHMENT  | 328 |
|            | MANAGEMENT AND MAINTENANCE   | 332 |
| PART III   |  |     |
| CHAPTER 4: | A COMPARATIVE CONCEPTUAL VIEW FOR OPEN SPACE PATTERNS IN THE TRADITIONAL AND CONTEMPORARY ENVIRONMENT: EGYPT | 342 |
| 4.1        | CONCEPT OF TRADITIONAL NEIGHBOURHOOD (HARAH)   | 343 |
| 4.2        | THE CONCEPT OF RECENT E.N.T. NEIGHBOURHOODS  | 353 |
| 4.3        | COMPARATIVE ANALYSIS BETWEEN THE TWO CONCEPTS  | 354 |
| CHAPTER 5: | IMPROVEMENT OF THE EXISTING RESIDENTIAL ENVIRONMENT  | 369 |
| 5.1        | INTRODUCTION   | 369 |
| 5.2        | FUNCTIONAL CONDITION   | 372 |
|            | USAGE OF SPACE   | 372 |
|            | CIRCULATION  | 377 |
|            | OTHER FUNCTIONAL REQUIREMENTS  | 382 |
| 5.3        | AN IMPROVEMENT FOR THE SELECTED RESIDENTIAL AREA   | 389 |
| PART IV    |  |     |
| CHAPTER 6: | CONCLUSION; PROPOSED CONCEPT FOR AN APPROPRIATE LANDSCAPE FOR URBAN EXPANSION IN THE EGYPTIAN DESERT         | 398 |
| 6.1        | AN APPROPRIATE LANDSCAPE CONCEPT   | 400 |
| 6.2        | OBJECTIVE OF THE PROPOSED LANDSCAPE CONCEPT  | 413 |
| 6.3        | APPLICATION  | 415 |
| 6.4        | FURTHER STUDIES  | 435 |

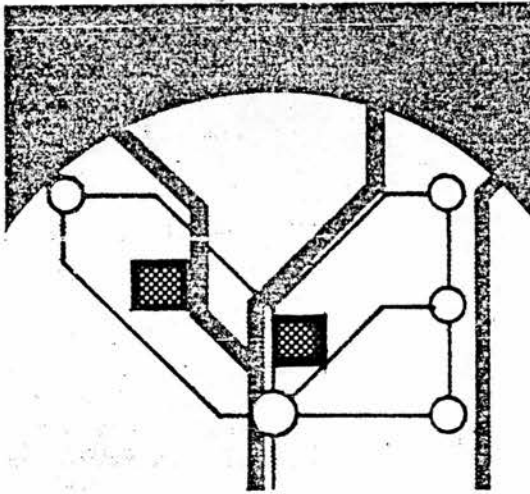
**APPENDICES:**

|          |                          |            |
|----------|--------------------------|------------|
| <b>A</b> | <b>PLANT INDEX</b>       | <b>438</b> |
| <b>B</b> | <b>FIELD STUDY INDEX</b> | <b>478</b> |

|                     |            |
|---------------------|------------|
| <b>BIBLIOGRAPHY</b> | <b>482</b> |
|---------------------|------------|

# PART I

## REGIONAL SCALE





## Chapter 1: A synoptic view of Egypt

### 1.1 INTRODUCTION

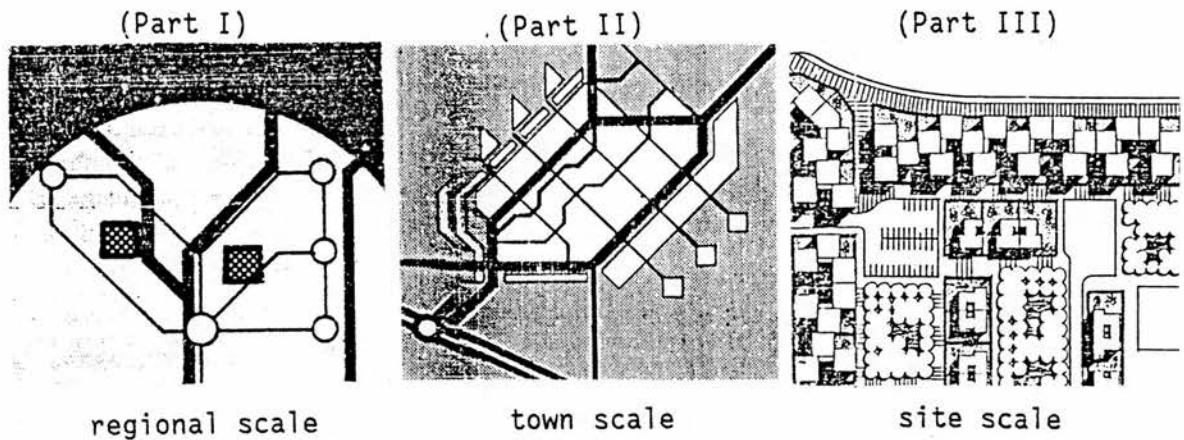
#### **The aim of the research**

The Egyptian Government started an overall development strategy after the war of 1973. Its purpose was firstly to create new towns on unused desert land on the periphery of the Nile Valley rather than on agricultural land within the Valley; and secondly to stimulate the national economy by providing jobs and housing away from the overcrowded cities of Cairo and Alexandria.

It is evident in retrospect that this new development lacked a proper understanding and application of landscape principles and concepts compatible with environmental dictates. Such understanding applied to this strategy would have helped improve the Egyptian environment and would inevitably have reflected upon the economy of the country, on the health of the people and their social and cultural life.

This research seeks to establish this understanding so that further mistakes are not made in the future. It will be concerned with a landscape brief for Egyptian New Towns, not only concentrating on the past and present errors and drawbacks in their landscape concept with a view to rectifying them, but also with proposing a foundation for an appropriate landscape for urban expansion in the Egyptian Desert. It will be based on an appraisal of existing landscape schemes of the E.N.T. (Egyptian New Towns).

The examination process of this research begins at a regional scale (Part I) and progresses down through town scale (Part II) to site scale (Part III) until every portion of the site is understood in relation to the region. Fig (1.1) shows the examination process:



**Fig (1.1) The examination process of the research (prepared by the author).**

The aim of this chapter is to present a synoptic view of Egypt and of those main factors which have a direct bearing on the subject to be examined in this research.

The chapter starts with an outline of socio-economic data contributive to the overall picture. Then follows an historical synopsis of Egyptian civilization through history and the influence of these civilizations on Africa generally and beyond. This is followed by a description of the existing environment and an outline of what is presently happening to the Egyptian heritage. Then the main difficulties having the most marked effect on the existing environment will be singled out.

Next, the Egyptian Government's efforts to solve one of the main problems which faces Egypt (crowding due to over-population in the Nile Valley) will be illustrated. At the same time the Egyptian New Towns Policy as a solution to the latter problem will be presented with discussion of its aims and scale. Finally, the environmental problems of these New Towns will be considered from the point of view of landscape.

## 1.2 SOCIO-ECONOMIC DATA

### **Site**

Egypt is situated at the north-eastern corner of Africa and occupies nearly one-thirtieth of the total area of that continent. It measures 1073 km in greatest length from north to south, 1226 km in greatest breadth from west to east and embraces a total area of almost one million square km [1]. Egypt's position has always been pivotal, in the past as a bridge between the Mediterranean and European worlds and those of Asia and between Eurasia and the African continent below. In modern times the Suez Canal has strengthened this role (Fig (1.2)).

### **Distribution of population**

The fertile land in the Nile Valley and the Delta - a mere 35189 square kilometers, today supports a dense population on what is only 4% of the total area. In this restricted area live 96% of Egypt's 45 million people (1983) [2]. The average density of population in the agricultural lands is more than 1250 persons per square kilometer while in the desert areas there are only 2 inhabitants per 7 km<sup>2</sup>. About half of the population lives in the urban areas, more than 20% of them concentrated in Cairo alone [3].

### **Population**

Recently, Egypt has undergone a very rapid population growth. According to a 1985 report by the Government's Central Agency for Public Mobilisation and Statistics, the population - which probably surpassed 50 million in 1986 - now increases by one person every 20 seconds or so, or by 1.294 m a year. Western experts (1983) reckon that the number of Egyptians, given an annual growth rate of 2.8 to 3 percent, will exceed 70 m by the turn of the century and could double in the next 23 years [4].

The scale and pattern of population growth has important implica-

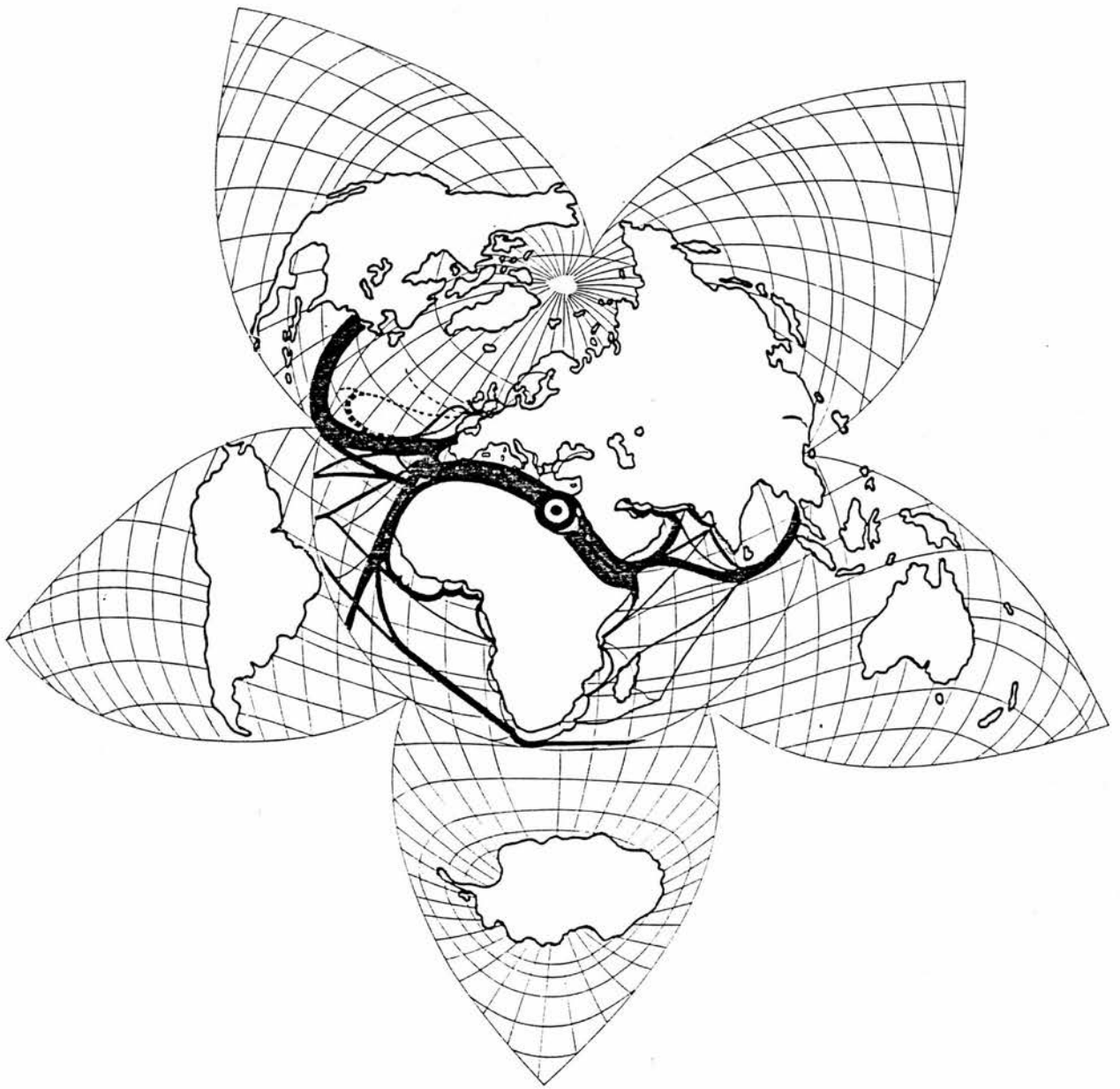


Fig (1.2) Egypt with its Suez Canal is in the centre of the world (SWECO, 10th of Ramadan - short description - M.H.R. Cairo, 1977, p1).

tions. Egypt's population is very young (40 percent or more under the age of 15) and the dependency ratio is high [5]. The economically active part of the population in Egypt is at present 26% (1976).

### **Culture and religion**

Egypt has had to undergo cultural and ethnic penetration by successive waves of aliens; Phoenicians, Greeks, Romans, Arabs, Negroes, Circassians, Turks and Nubians. However, it has remained ethnically homogeneous with native Egyptians constituting over 93% of the population.

Islam is the official religion of Egypt and the religion of over 95% of the population. The largest minor denomination is Christianity (Coptic) [6].

### **Social conditions**

Egypt is in the middle range of developing countries with an annual per-capita Gross National Product of \$250 in 1974-1975; it was then about as well-off as Bolivia, Thailand and the Philippines. It is richer than the majority of African states, but poorer than most countries in the Middle East. Egypt's population is culturally relatively homogeneous and the economic and social gulf between town and country is less than in many developing countries [7].

### **Urbanisation trends**

In 1937 only 25% of the population of Egypt lived in cities and towns but by 1976 that had increased significantly to 43.9% [8]. Fig (1.3) illustrates the changing distribution of rural and urban populations over the past 40 years and the trends which are projected up to the end of the century under optimistic economic growth assumptions.

In seeking to extend settlement from the confines of the Valley of the Nile (wet Egypt) to other areas, considerable effort is being made to discover new resources and a new rationale for development in the desert areas of "dry Egypt". Surveys of soils, ground water, mineral

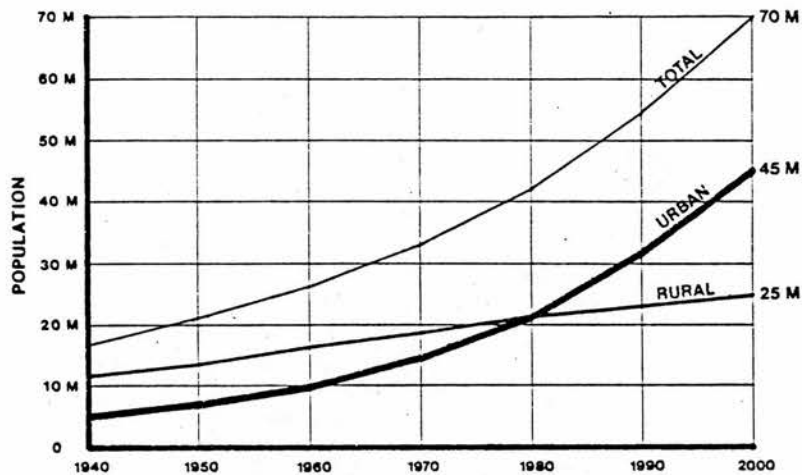


Fig (1.3) Rural/urban population shift: Egypt (Tippetts, et al, Suez Canal Regional Plan, M.H.R. Cairo, 1976, p18).

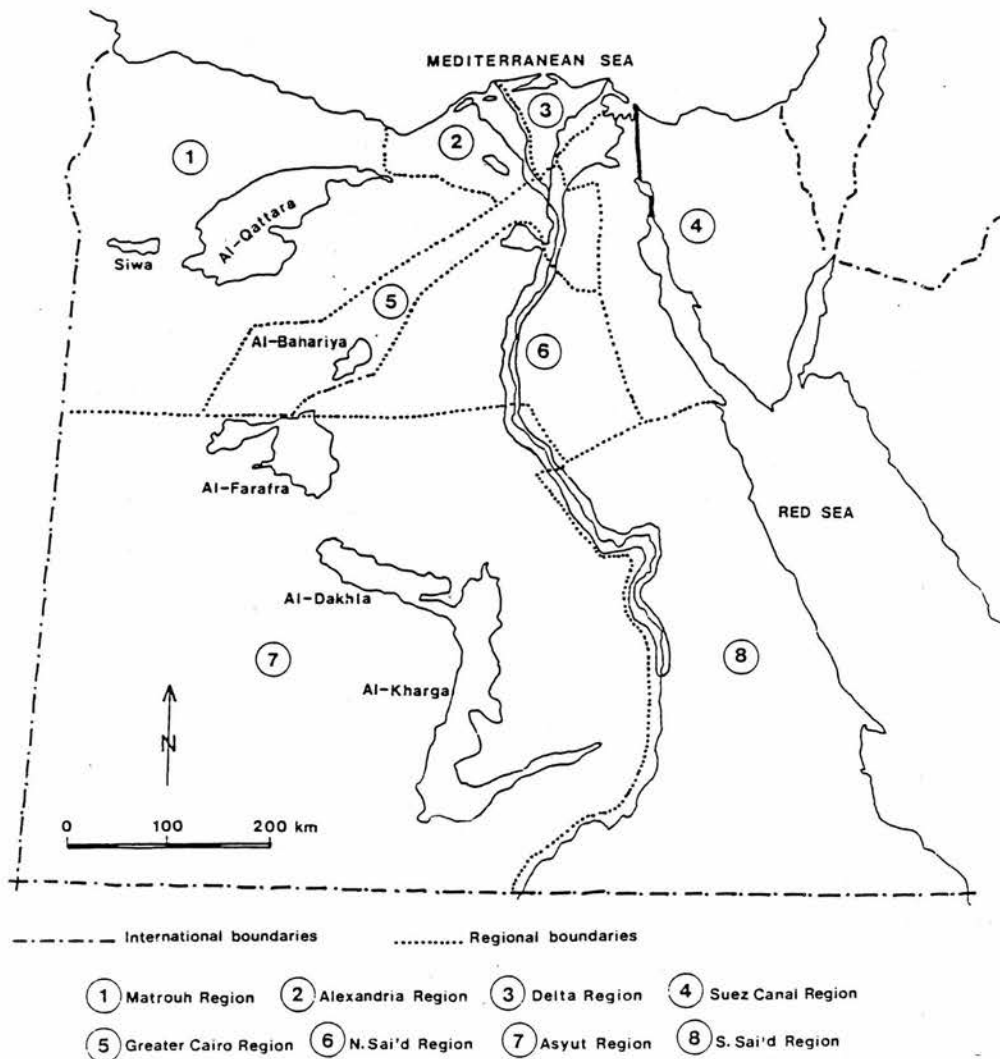


Fig (1.4) The recommended planning regions of Egypt (Beshara, A., "Planning new development regions in Egypt", Third World Planning Review Vol. 3, No. 2, May, 1981, p235).

wealth (including oil) and tourist resources are being conducted in various areas of potential development. These are around the Delta, Aswan, the New Valley, the Red Sea coast, the north-west (Mediterranean) coast, the Qattara Depression, the Suez Canal and Sinai (Fig (1.4)).

### **Government**

The basis of government in Egypt is the constitution of 1971 which proclaims "an Arab republic with a democratic and socialist system based on the alliance of the working people and derived from the country's historical heritage and the spirit of Islam" [9].

### **Economic growth**

The first decade of independence witnessed a new phase in Egypt's long-term economic growth. From about 1957 to 1965 the country sustained an annual rate of economic growth of over five percent.

In 1965-1967 economic growth slowed down as a result of military expenditure. During the period 1967-1975 the equivalent of one-quarter to one-third of G.D.P. was allocated to public expenditure (including military expenditure) while the preexisting stocks of productive capital goods and social services deteriorated through insufficient maintenance and replacement [10].

In 1973 Egypt started a major programme to boost economic development. An important aspect of this was the so-called "open door policy" which has been applied without any preliminary studies. This policy has brought the country to the edge of disaster [11]. (This policy will be discussed later, Section 1.5.)

The present major sources of revenue in roughly descending order of amount are:

- Exports, of which oil accounts for about three-quarters of the total.
- Foreign aid.



- Remittances from Egyptian workers abroad.
- Suez Canal revenues.
- Tourism.

These sources of income are clearly highly dependent on external factors [12].

Table (1.1) illustrates key facts of the recent economic framework of Egypt. The backbone of the Egyptian economy was and still is partly dependent upon agriculture.

Table (1.1) The key facts of Egypt's economy  
(Gowers, A., "Egypt, the limits  
of gradualism", Financial Times,  
June 27, 1988, p7).

| KEY FACTS                            |             |
|--------------------------------------|-------------|
| Population .....                     | 51.2m       |
| GDP .....                            | E£44bn      |
| per capita .....                     | E£859       |
| Trade balance .....                  | -\$5,259m   |
| Exports .....                        | \$2,741m    |
| Imports .....                        | -\$8,000m   |
| Services balance .....               | \$3,000m    |
| Current account balance .....        | -\$1,300m   |
| Total external debt .....            | \$44.1bn    |
| US aid (1988) .....                  | \$2,290m    |
| Average consumer price increase .... | 25 per cent |

The share of industry in the national income has risen from 6% in 1952 to 22% in 1970-71. The advancement of industry is considered most important as the base of economic growth in Egypt. The gross national product has been increasing since 1959, but at the same time total consumption parallels or at least approaches it, as a result of rapid growth of population [13].

The physical and climatic data will be examined in Chapter 2, under the title of "Regional landscape factors".

### 1.3 HISTORY

Egypt was one of the centres of greatest human activity as man gradually extended his range throughout the continent of Africa. Fossil evidence of more advanced man in Egypt dates from as long ago as forty million years [14]. The development of primitive Palaeolithic and Neolithic man is summarised in Table (1.2).



| Period and duration                      | Stage                          | Artifacts   |
|--|--------------------------------|---|
| Middle Palaeolithic<br>20 000--16 000 BP | hunting and plant<br>gathering | scanty plant remains  |
| Late Palaeolithic<br>16 000--9500 BP     | hunting and plant<br>gathering | grinding stones, denticulate tools,<br>scanty plant remains |
| Terminal Palaeolithic<br>9500--6000 BP   | hunting and plant<br>gathering | grinding stones, denticulate tools,<br>scanty plant remains |
| Neolithic<br>6000--4500 BP               | herding and cultivating        | grinding stones, sickles, exten-<br>sive plant remains      |

**Table (1.2) Food economics of Paleolithic and Neolithic man (El Hadidi, N., "Foods plants of prehistoric and predynastic Egypt", Wichens, G. (ed.), "Plants for Arid Lands", George Allen & Unwin, London, 1985, p88).**

Agricultural production in Egypt first appears to date from the sixth or early fifth millennium B.C. and corresponding with the Neolithic period. It was characterized by the change from food gathering to food production. In Egypt, when the Sahara wet phase was drawing to a close during the later Neolithic age and the desert tributaries were drying up, the settlements on the edge of the Nile Valley could no longer be maintained so that the communities were moving down the valley to the naturally irrigated flood plains of the Nile. Climatic changes plus changes in the hydrology of the Nile resulted in decreased populations of wild grasses with a consequent increased reliance on cultigens. The inhabitants discovered that a reliable supply of grain, that is crop production, might be assured by sowing seeds in the silt left by the retreating flood water of the Nile [15].

The adoption of agriculture during the Neolithic period led to the development of a distinctive economy in which cultivation and herding, as well as the exploitation of the Nile's resources, were inseparable. At the same time, the earlier near-isolation had been replaced by a flourishing long-distance trade with central southwestern Asia and southward extending deep into Africa.

During the third millennium B.C. Egypt established her position outward from Africa. She placed her imprint on the Mediterranean world, but she also faced inwards to exert the authority of her ideas and

institutions on the people of Africa. The main line of Egyptian penetration to the south was trade which only gradually led to conquest and occupation. From the Egyptians' point of view penetration and military strength was a necessary step in a carefully executed policy to develop a major trading centre far down the river where ivory and gold could be obtained.

The Egyptians undertook several military expeditions which led to the establishment of a series of forts along the Nile as far as Semna (second cataract) in 2150 B.C. (Fig (1.5)). These forts ensured the free flow of commerce from the land known as Kush at Kerma. By 1588 B.C., Egyptian power extended further to Napata (later to become capital of the Kingdom of Kush) and also beyond the fifth cataract to Meroe by 1340 B.C., where the second capital of Kush was established. Later in 500 B.C. the Egyptians reached Punt by sea and land.

Clearly the Egyptian civilization had a considerable influence on East Africa and the Nile Valley. Archeological evidence indicates that the culture of the whole area had an Egyptian overlay. This influence spread to the west of Africa through the east-west highway along the southern edge of the Sahara [16]. This might explain the rise in the west of several kingdoms with the idea of divine kingships traceable perhaps to Egypt and Meroe.

The River Nile played a principal part in this spreading of Egyptian civilization, easily accommodating the migration of both people and ideas.

At the same time also, we cannot ignore the influence of Egyptian civilization on western culture through contact with the Aegean and Greece.

### **Landscape architecture in the Egyptian cultural heritage**

Landscape architecture is fundamentally concerned with the environ-

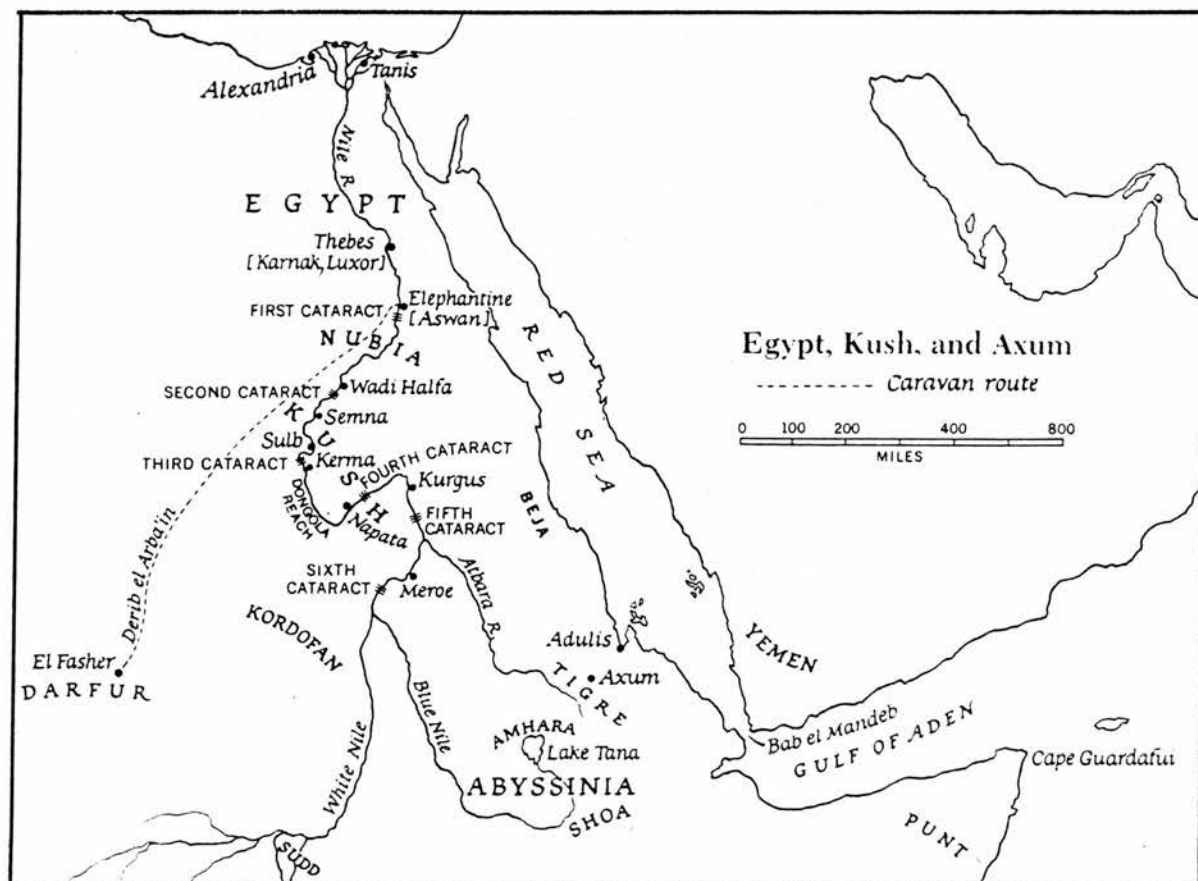


Fig (1.5) Egypt and Africa in the ancient world (July, R., A history of the African people, Faber, L., London, 1970, p31).

mental adaptations effected by man for his living arrangements. Egyptian civilization formed part of one of the three major early centres of civilization so far recognized, namely Middle Eastern (Mesopotamia), Asian (India, China) and precolombian-America. The Nile civilisation together with those of the Tigris, the Euphrates and the Indus may be regarded as the chief components of the Middle Eastern culture: the Nile is of course chiefly notable for the spectacular achievements of the Pharonic era extending well back into a predynastic past but producing its greatest achievements over the three and a half millenia before its domination and subjugation by Greece and Rome. The Nile Valley had a spectacular Pharonic civilization for a long period from 4000 B.C. to 300 B.C.

When one looks back at Egypt's civilization, one finds many examples of works whose actual form suggests their having influenced the landscape architecture of succeeding centuries. A study of ancient dynastic Egyptian sites reveals that they planned all their monumental works according to a detailed and meticulous attention to architectural and landscape theories, taking into consideration their needs, habits, religious faith, environment and the general composition of the site [17]. One example of such minute study is the Pyramids, where the design exemplifies attention to the relationship between its buildings and the surrounding landscape. Also, the temple of Der-El-Bahari, in which historians have detailed architect Senemul's attempt to integrate the architecture of buildings with the surrounding site (1505 B.C.) (Fig 1.6(a)). Egyptian cultural history is very well documented graphically in paint and hieroglyph on the stone walls of the temples and tombs. These show for example the very high level horticulture had reached in Hatchepsut's period, 1520 B.C. She transplanted nursery stock trees from Puntland, shipping them hundreds of miles to her temple (Fig

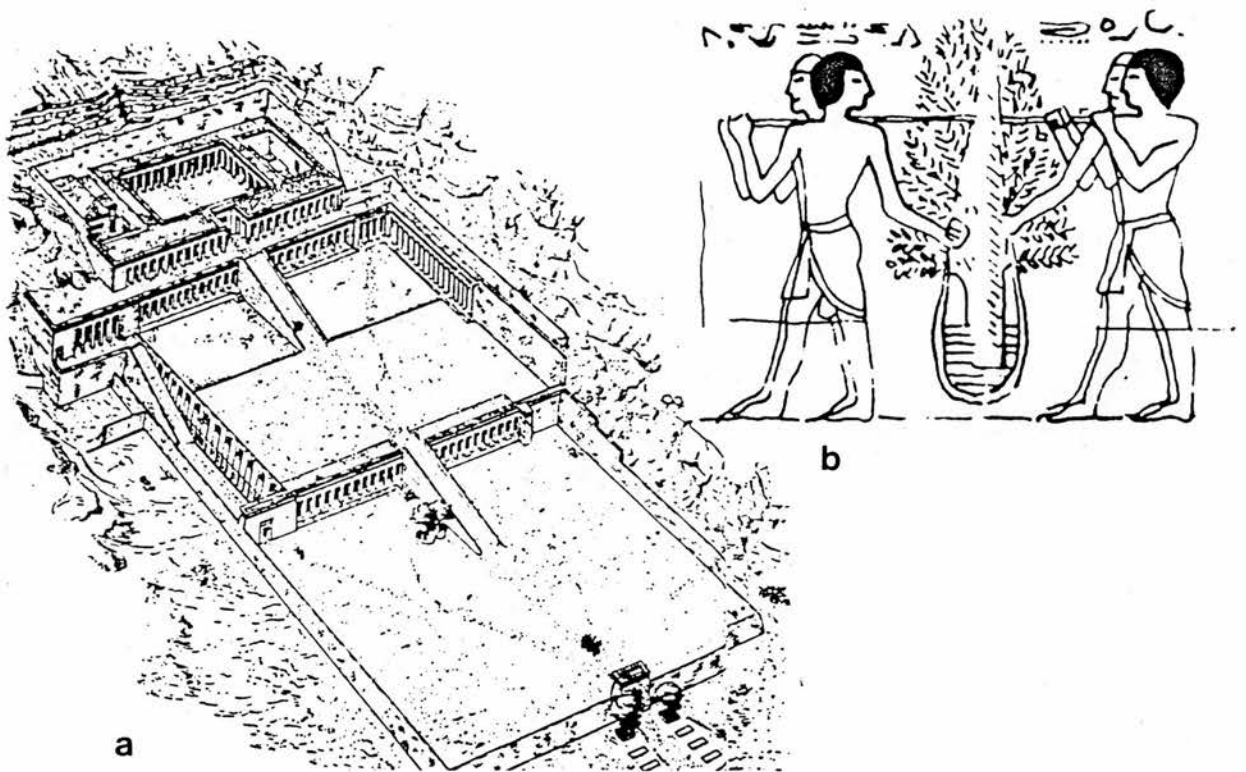


Fig (1.6a) Der El Bahari Hatchepsut 1520 B.C. The courtyard is lined with a grid of shade trees (Oldham, J., Garden in time, Landowne Press, Sydney 1980, p16).

Fig (1.6b) Transplantation of trees "Hatchepsut" (op.cit. Oldham, p17).

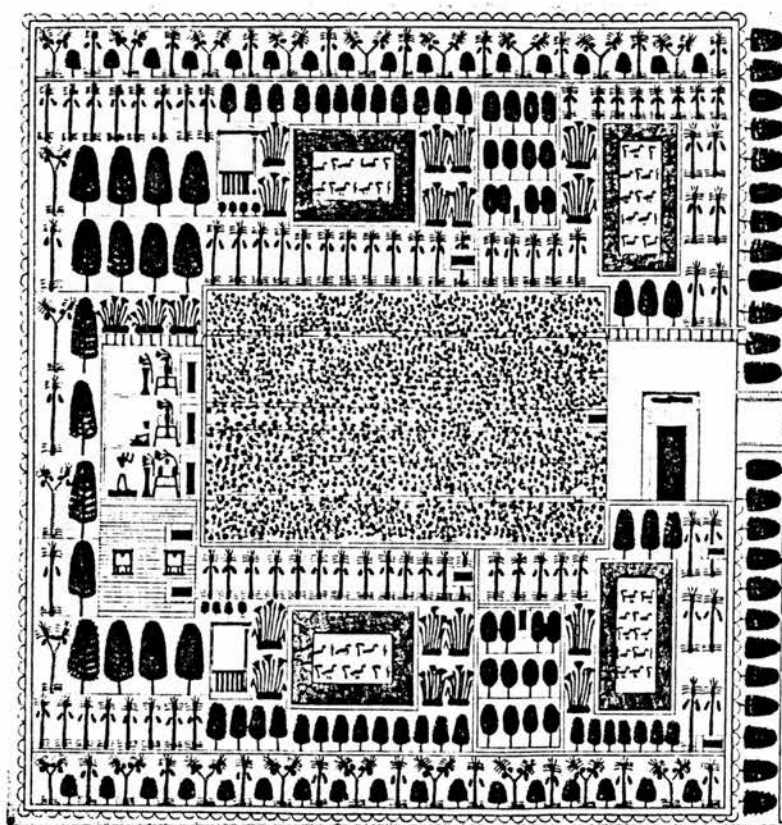


Fig (1.7) Wall painting from a tomb depicting house and grounds of an official at the court of Amenhotop (1400 B.C.) (Newton, N., "Design on the land, Harvard University, U.S.A., 1971, p4).

(1.6)). One of the most detailed surviving illustrations of the garden art of the dynastic Egyptians was found in the tomb of a high official at the Theban Court of Amenhotep III, 1400 (Fig 1.7). Here again the influence of environmental factors especially climate is evident.

Christianity came from the north, germinating in Egypt after the period of Constantine the Great (324-337) A.D. with a significant impact in Alexandria [18]. Christianity led to the renewed development of art and intellectual life in Egypt, and the remote deserts were host to many monasteries (Deir). Many of these monasteries still remain in the Egyptian Desert showing how buildings were adapted to the desert climate. The walled garden was attached to the monastery at that time. This type of garden was used functionally for growing food and keeping some domestic animals. It was a small farm which made the residents of the monastery completely independent; Fig (1.8) shows one of these monasteries in Sinai Egypt.

Islam came to Egypt in 641 A.D. and Egypt became one of the main supports of the Islamic world [19]. However, during the first period of Muslim rule (640-963 A.D.) under Khalipha, Copts (the Christians in Egypt are known as Copts) enjoyed freedom to worship unoppressed, although the country was undergoing a gradual conversion to Islam supported by the infrastructure of the political regime.

"Through this period the Islamic world in striking contrast to Europe of the Middle Ages, showed profound appreciation for the outdoor, owing to the climate that prevailed in most of the occupied regions and to a strong moral emphasis on family privacy" [20]. It was usual for even the simplest house to have at least one enclosed, but unroofed court where a considerable part of the daily living took place. The Islamic garden concept with its courtyard design and the use of water has a great influence on the courtyard garden in the traditional urban





Fig (1.8) Deir (Monastery) St. Catherine, Sinai, Egypt. The walled garden was attached to the monastery and has been extended in different parts over time (sketch by the author).

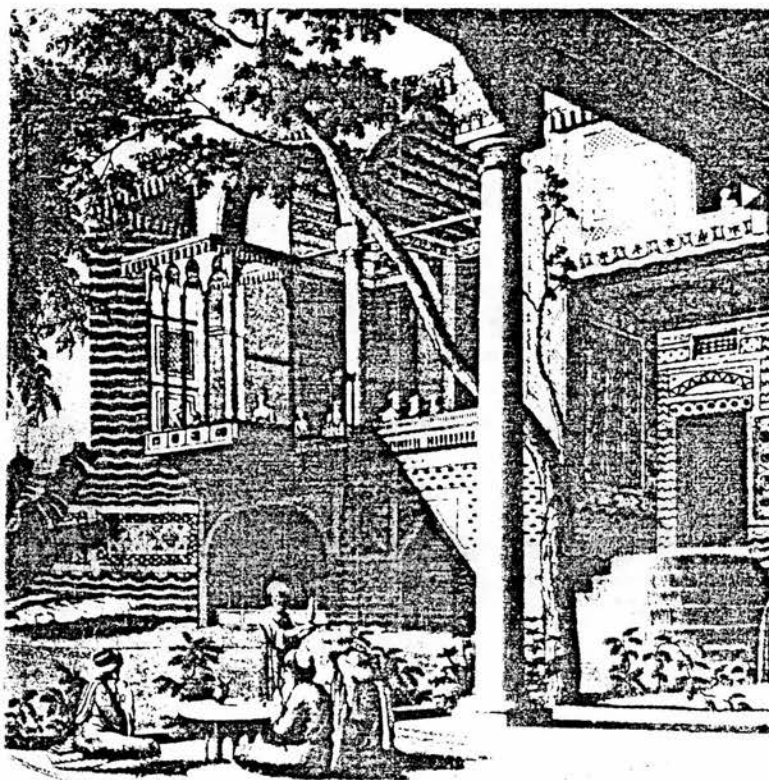


Fig (1.9) A typical main courtyard "Palace of Qasimbey" (Raymond, A., "The residential districts of Cairo", Serageldin, S. (ed.) et al., The Arab City, Riyadh, Saudi Arabia, 1982, p107).

form. It has a great response to climate; the outside is hostile, hot and dusty, while the inside is shaded, cool and protected by thick walls. The physical heritage of Islamic culture in terms of cities, open space and buildings whether in the form of complexes or in the form of individual buildings is extremely well represented in Egypt (Fig 1.9)).

All these civilizations, Pharaonic, Coptic and Islamic, are part of the Egyptian cultural heritage and inform the attitudes and lifestyle of the present-day Egyptians.

#### 1.4 EGYPT'S ENVIRONMENT ON THE BRINK

Anyone who sees the remains of Egypt's cultural heritage today will be appalled at its state of neglect. Dr. F. Werkmesiter says "Poor Baedeker! If he knew what happens nowadays to the quiet valley of the Nile whose "lofty calm" he described in his 1928 Guide to Egypt. Its quiet is disturbed by the noise of diesel engines, by buses allowed to drive on asphalt directly to great once removed antiquities, turnpikes cut across the landscape, lights where none are needed" [21].

This is the present condition of the Nile's most valuable heritage today. This however is not the whole problem. It is in fact only a very small part of Egypt's present environmental degradation.

The largest cities suffer from major problems caused by population growth and overloading of urban facilities causing great imbalances between man and his environment. For instance, in 1975 over one-quarter of all city buildings were not connected to the water supply, 20% were without public sewage and 41% were not connected to the electricity network. Urban areas typically lack gardens and public open space. In Cairo available public open space does not exceed  $1.6 \text{ m}^2$  per person, while the government recommends  $8.0 \text{ m}^2$  per person [22].

In the countryside, random urban extension has gobbled up the most



valuable agricultural land at an annual rate of about 600 ha (for Cairo region only) [23]. Most village houses are built of mud brick, with narrow streets and paths, winding and unpaved. No sewage systems are provided and drinking water is carried from the public taps.

As regards Egypt's natural resources, forests have been plundered and rivers and beaches polluted until even fish and wild life have been killed or driven off by the stench and fumes. The bare undulating forms of hills and natural slopes of mountains have been badly eroded. Sand dunes have moved and covered newly cultivated land.

All this has happened, yet there is still no thought of an official body whose concern is natural conservation. The Egyptian layman is the victim of this situation leading him to lose his awareness of nature.

One can tally all these large and small instances of pollution but the question remains: "Who is responsible?".

"Perhaps all of them, the ministries, the administrators, planners, economists, architects, ecologists, etc - all of them" says Dr. H. Fridrich. "But I think most of them don't feel it", he adds [24]. They are in effect largely ignorant of the damage they are doing.

This is the real truth about Egyptian authority; their neglect of the environment has led them to lose contact with their surroundings, so that they share a total insensitivity to the real damage they have done to their environment.

### 1.5 THE MAIN PROBLEMS

To make the picture clearer, Egypt's main problems will be examined in some detail to illustrate the reasons for the situation just described. Egypt is confronted with three fundamental difficulties; very limited land, a runaway population and an inefficient legislative system. There are many other peripheral problems, of course, but these are basic and pervasive.





Fig (1.10) Giant lotus, the Nile Delta blossoms in a landsat mosaic showing farm lands in red. The Pharaohs reclaimed land at El Faiyum, the "leaf" below the Delta (National Geographic, March, 1977, p316-332).



## Limited land

The desert areas occupy more than 96% of the total area and the amount of arable land, built up over the centuries by alluvial deposits from the Nile, is meagre indeed. At many points in the Nile Valley, it extends only a mile or so on each side of the river, although it fans out in the delta just north of Cairo as the Nile approaches the Mediterranean Sea (Fig (1.10)). Some otherwise arable land is covered by cities, roads, canals, military installations and the like.

In summary, less than 3% of the whole country is cultivated. However the cultivated area has grown very slowly over the last century in comparison with population growth (Fig 1.11). Over the period 1897-1974 the area of cropped land or cultivated land increased giving a somewhat better but still dismal result.

At present, however, these cultivated areas are growing only very slowly and there are new obstacles working to stem this growth: the first one is the loss of fertile land; it is widely estimated that 30000 to 60000 feddans are lost per year to urban and village encroachment. A World Bank official has described this situation saying "They are losing better quality land and gaining in marginal land". Since 1952 1.1 million feddans of first and second class land were lost because of urban encroachment; at the same time 1.8 million feddans have been gained from desert reclamation of fourth or fifth class land [25].

The second obstacle is the raising of the water table in many areas as a result of bad drainage systems which causes a reduction in the yield of the land.

The third one is the loss of top soil deposited by the annual Nile flood over the centuries, as a result of the construction of the High Dam which controls the flooding and traps the silt behind the dam. The

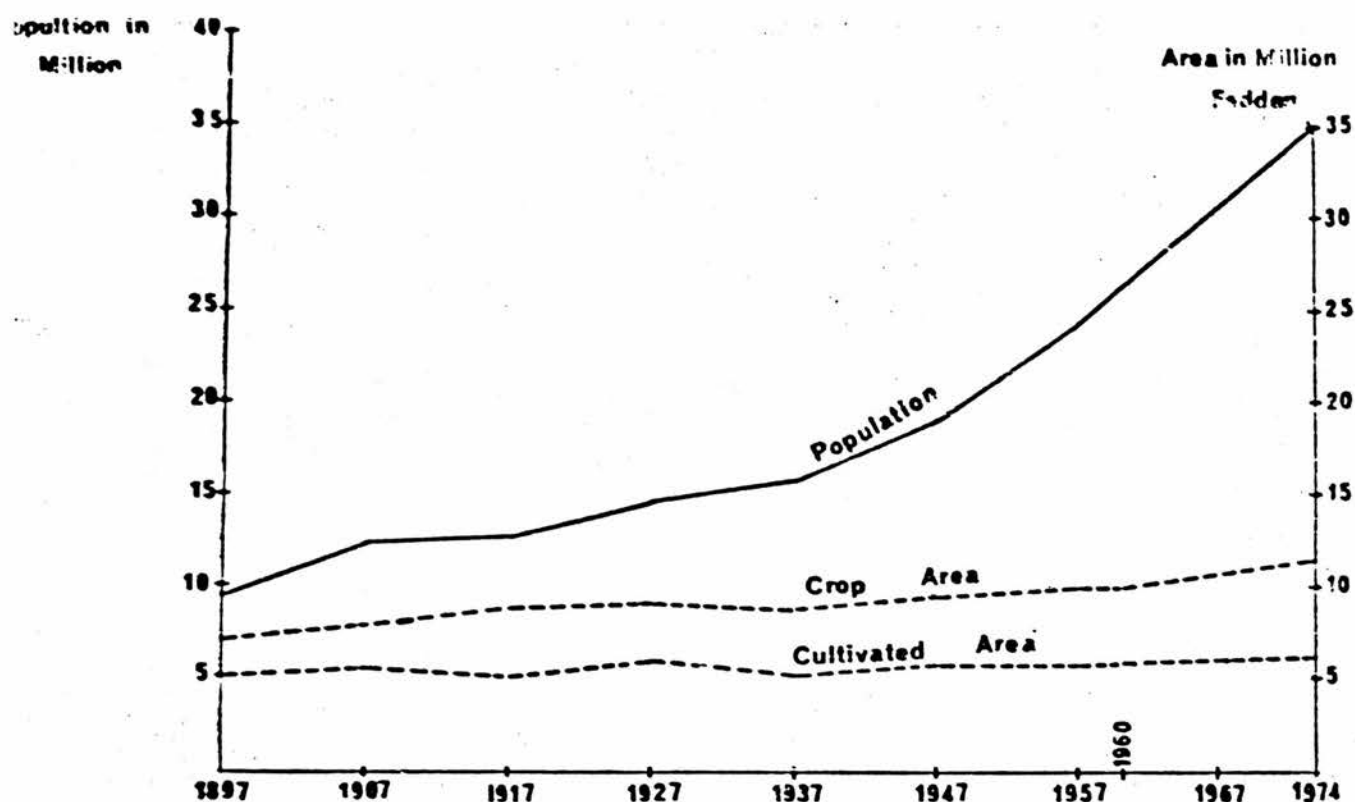


Fig (1.11) Growth of population compared with the growth of cultivated areas and crops in Egypt (op.cit. Attia, Y., p2).

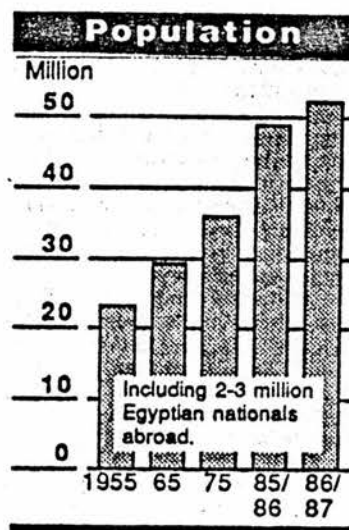


Fig (1.12) Population growth of Egypt (Gowers, "More and still more mouths to feed", Financial Times, Monday, June 27, 1988, p10).

existing Nile Valley mud has traditionally been used in the manufacture of building bricks. The soil erosion is accelerating because of the lack of silt. Loss of top soil has forced the farmers to use larger and larger amounts of artificial fertilizer which will exhaust the soil and the natural habitat.

The fourth obstacle is the lack of water resources available. Whatever water resources there are at present cannot cope with the rapid new sought after development. In addition the search for new water resources requires tremendous effort and considerable financial backing.

### **Population growth**

The second difficulty is the runaway population growth or, it might be said, the imbalance between the growth of the population and productivity. Fig (1.12) shows that during the recent decades Egypt has witnessed a very rapid rate of population growth. From figures previously given it may be estimated that by the year 2000 the population of Egypt will have increased by a further 25 million, who, of course, will need to be provided with suitable housing, food, health and recreational facilities.

Nowadays there is a large gap between the growth of population and crop productivity (Fig 1.11 above), as discussed above. At the same time the population pressure has started in different ways to affect life in Egypt. The pressure on land, especially in the capital cities, is one example. The situation in Cairo will be described briefly to illustrate the size of this problem.

Cairo as a city was designed to accommodate about 1.5 million people. The population of Cairo has increased rapidly from 2.166 million in 1945 to an estimated 9 million today, and is expected to reach 16.5 million by the year 2000. The Greater Cairo Region now represents about 22 percent of the total population of Egypt, and 43% of

the urban population. The annual population increase of G.C.R. in total has been around 4%. Migration has been the main component of population growth in the Greater Cairo Region.

The situation could be summarised as follows; very high residential densities in inhabited areas causing drastic deterioration of the living environment, lack of public services and utilities and green space and gobbling up of available agricultural land due to uncontrolled urban extension at an annual rate of about 600 ha [26].

In addition, there are many other problems caused by population pressure. The main current problems relate to housing, electricity, drainage, sewage, education and health, but a housing deficiency is the most critical one.

A total deficit of about 1.634 million units of housing and a need for about 6.218 million new units by the year 2000 are estimated by the Egyptian authorities, who hope to provide an annual average of about 200000 units, although only 50000 units are actually being provided at present. The accumulated deficit seems therefore to point to a bleak future.

### **Inefficient legislative system**

Before talking about the third difficulty, no-one can ignore the fact that economic difficulties have overtaken many places in the world, and it is therefore particularly important that economic resources are put to work where the improvement of quality in the main plans will be most effective. This is the absent factor in Egyptian policy.

Egypt is still trying to find a satisfactory new identity for itself. There has been confusion of purpose after years of socialism under Nasser (1952-1970), followed by Sadat's open door policy to the west and private enterprise (1973-1980), and this has generated a lot of resentment because of changes exacerbated, income disparities and corruption.

As a result of irresponsible policy over the last decades, Egypt has descended from a vantage point of food self-sufficiency in 1973 to a position of heavy reliance on imports and food aid (largely from the US); it is importing about half of its food. At the same time, with the national goal of "food security", farm land has been lost due to the spreading of towns and cities, highways, factories, military bases and so on, all of which want to be as close to transportation and power grids as possible. "There are laws against these, but they are just not applied" says a World Bank Official. Law enforcement in Egypt is the exception rather than the rule [27].

Another example of bad management is given by Carl Schiren, director of grant and project development at the American University of Cairo. He says "Egyptian Government officials have lost sight of the unique urban fabric of Cairo. It's been sold to private investors or undetermined technocrats with no aesthetic sense" [28]. He describes how the character of the city is being destroyed by high rise hotels and how planners give absolutely no value to green space. Another example is given by E. H. Lube, a member of a study team who visited Egypt to review initial efforts towards the development of a national park/nature preserve system. He says "Finally, as expected, we found that their most difficult task was to convince our Egyptian host that sophisticated natural areas and developments and interpretive programmes are premature and impractical at this time" [29].

#### **Amelioration of the situation**

Much could be done to overcome these three main difficulties.

The obstacle of limited land was dealt with in the past by reclamation of desert land. Reclamation of land from the desert is not new to Egypt. In fact, the agricultural land of Falyum Depression (Fig (1.10) above) is due to a successful land reclamation project that was

started by Amenemhet III who died in 1301 BC [30]. At the present time, the total reclaimed area from 1954 until 1984 is about 912000 feddans, 759300 feddans in the Nile Valley and its Delta, and the remaining 152700 feddans from desert. A successful symbolic example was demonstrated in Mudiriat Al Tahrir, west of the Delta; in 1967 some 45000 feddans had been cultivated. A witness to the progress of the project over 23 years said "Today the first demonstration experiment has become a miniature Garden of Eden (Fig (1.13)). Where 25 years ago the desert sand still blew in the wind, today there are fruit trees, yielding rich harvests" [30]". The land reclamation of the periphery of the Nile Delta is successfully growing (Fig (1.14)).

There are plenty of land and water resources which could be used to reclaim more areas of the type of Mudiriat Al Tahrir. Based on studies made by the Ministries of Irrigation, Reclamation and Agriculture, 3.5 million feddans could be added to the cultivated land total using available resources (Nile water). Another 0.3 million could be added based on rainfall and underground water outside the Valley.

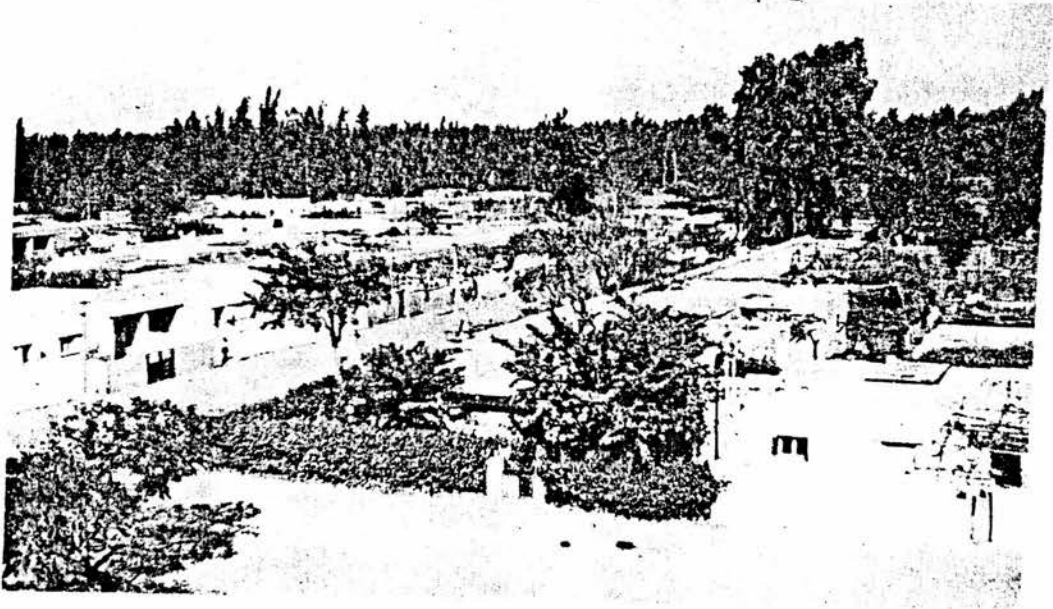
As for the second difficulty, many people believe that growth of population is one of the main obstacles to any progress and is ascribed to religion. Most religious doctrines are against birth control on the grounds that if God had wanted man to use birth control, it would have been stated in the divine scriptures, such as the Bible or Holy Quran.

Man is considered as the main and principal factor in the ecosystem of life, and any confusion in the system is as a result of imbalance between man and the other factors. If man tries to change the natural system there will be an unnatural result. For instance, the Chinese experiment which aimed to reduce the population from 1000 million to 800 million by the year 2000 AD through the application of a one-child family programme. An official study made by the Chinese authorities of





Fig (1.13) a) Om Saba in 1954; view from the mosque towards the first group of houses.



b) Om Saba in 1977; the large cultivated areas are no longer visible. The village appears to be surrounded by a dense forest, although the tree planting occupies almost 5% of the area (Werkmester, H., "Mudiriat Al Tahrir - new province in the desert", Garten and Landschaft, November, 1979, p847).

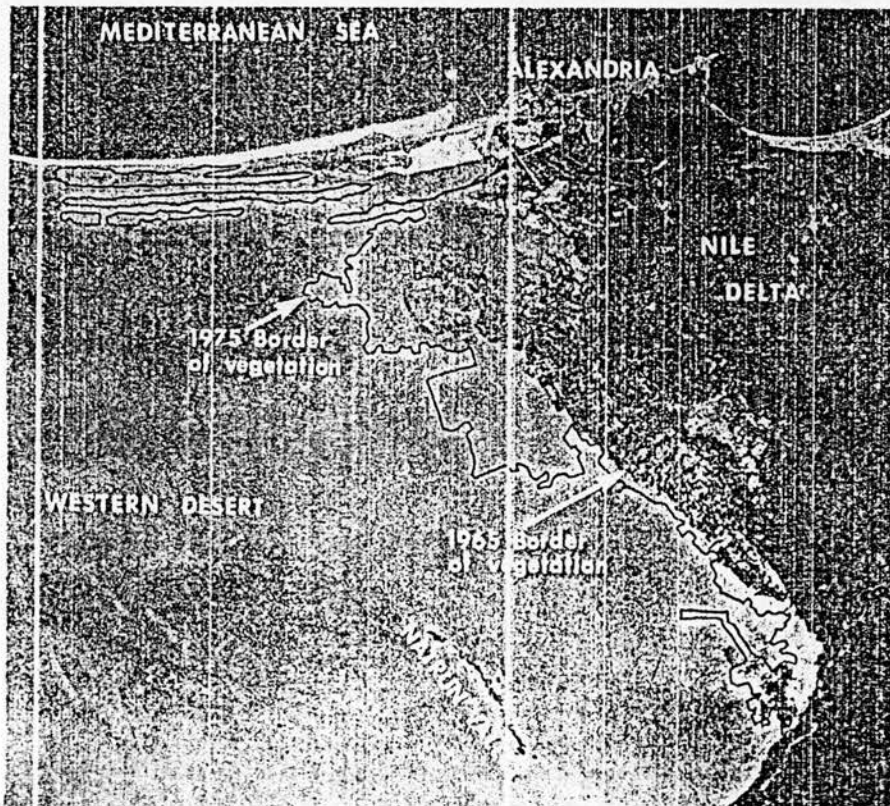


Fig (1.14) Examples of successful reclamation projects in the Western Desert west of the Nile Delta (El Baz, Desert and arid lands, USA, 1984, p4.

the new generation reported that this generation proved to be selfish, careless, irresponsible, spoiled and with no sense of discipline at all - a result found to seriously affect the social infrastructure of China [31].

Egypt has a large human resource and the work force may be considered as one of the major sources of revenue. However, the economically active part of the population in Egypt is 26 percent only (1976); this number is smaller than in other countries. Some 3 million workers work abroad earning foreign currency, a resource with impressive potential which, given the right leadership, economic incentive, training and tools, should be capable of achieving great progress.

The productive time in Egypt is 27 minutes/day, while in First World countries it is 10 hours/day and in Japan 14 hours/day.\* The solution at the national planning level would be to find a formula that will increase productivity per person so that it is greater than consumption. In such a case, an increase in population would mean an increase in productivity and services and the problem would be solved.

An inefficient legislative system seems to have been the main obstacle to Egypt's development during the last three decades. This controls and affects the other two difficulties. Egypt needs good management and planning, and the failure to provide these will lead to disaster. Generally, as Dr Dessok says "There is no lack of technological views, diagnoses and solutions from both Egyptians and foreigners, what we need is a decision" [32]. At the same time we need to stop the corruption and apathy that saps so many efforts at improvement.

Napoleon, one of a stream of invaders and colonists to intervene in Egypt over its extraordinary history, said "Under a good administration the Nile gains on the desert, under a bad one the desert gains on the Nile" [33]. Every Egyptian should contemplate the meaning of these

---

\*"It seems that these statistics ignored the woman as a productive source in the Egyptian community".

words and realise also that there are no quick solutions; Egypt's leader and his people will have to be dogged and determined in the long run. The government's first task is to provide jobs by launching new development projects. Next, manpower should be trained to acquire the necessary skills to implement these projects. Finally, the government should ensure a continuous follow-up of implementation of these projects.

#### 1.6 NATIONAL DEVELOPMENT PLAN FOR EGYPT

Some of the serious problems facing Egypt are overcrowding in the Nile Valley (3% of the total area of Egypt), the urban invasion of highly productive farmland (the 1976 census found 44 percent of the population living in urban areas (Fig (1.15))), the acute shortage of housing and services, the apparent as well as the hidden and seasonal unemployment and the social reflection of such problems upon Egyptian communities. As a result of all these things, there must be a new general plan for Egypt and its infrastructure. A number of ideas have been put forward.

The first one is presented by Dr Ibrahim Karim (Ministry of Planning) [34]. The plan is orientated towards coastal areas in the Mediterranean and the Red Sea to create new urban centres along the coast. This will lead to the creation of a new N-S axis parallel to the Nile. A new secondary axis will be created to serve the area from the Nile Valley (Fig (1.16)). The resulting expansion of the population centres from along the Nile would make an important impact on what he calls the greenness problem.

This drainage of the population from the Nile Valley towards the new urban centres will raise productivity through the industrialization of tourism as one example of development in these new urban areas. A similar axis can be created in the E-W direction along the Mediterranean

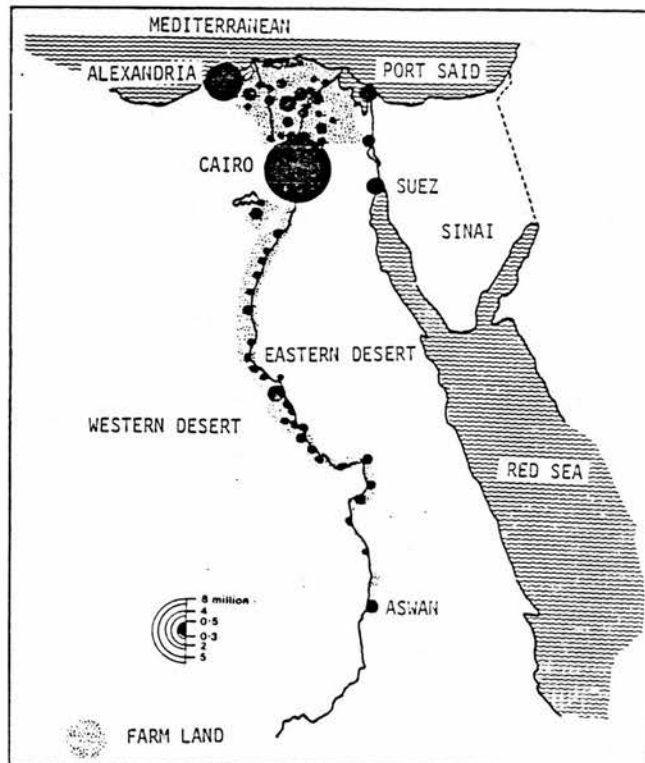


Fig (1.15) About 44% of the population live in urban areas, concentrated primarily in Cairo, Alexandria, Suez and Port-Said (Serageldin, M. (co-ordinator), *et al.*, "Planning for the capital city in the context of Egypt; history and development, The Aga Khan Award for Architecture, 1985, p94).

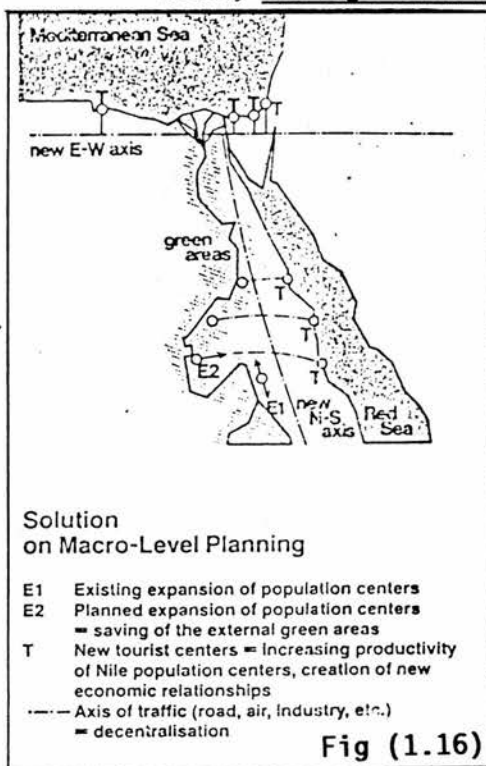


Fig (1.16)

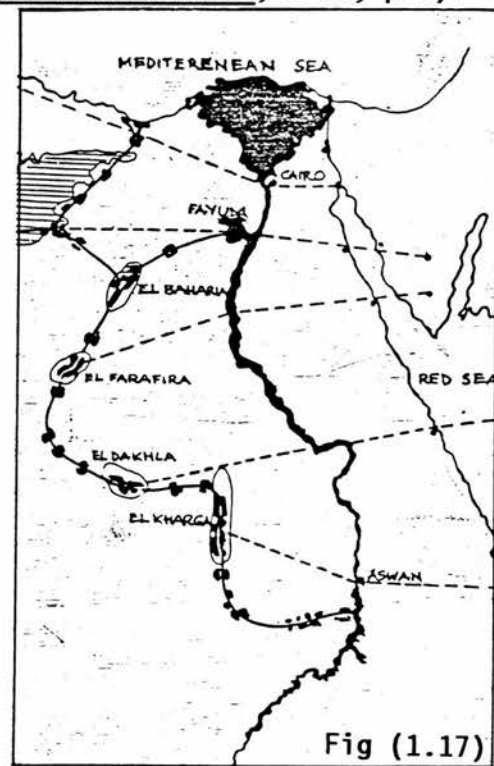


Fig (1.17)

Fig (1.16) Towards a general plan for Egypt (Karim, I., *IFLA Year Book*, 1985-86, p175).

Fig (1.17) The proposed project for reclamation of the Western Desert. (*op.cit.* Attia, p38).



coast to achieve similar results.

The second idea was proposed by Professor Glowezesk [35] who worked for some years in desert development in Egypt. Professor Glowezesk's idea of reclamation projects in the Western Desert is based upon the exploitation of the lowlands stretching roughly 150-200 km west of and parallel to the Nile Valley from the latitude of Aswan in the south towards the Mediterranean coast and the Nile Delta in the north (Fig (1.17)). Several of the existing oases in these areas will support some agriculture and human settlement and the natural resources found in the desert will also help to create a new industrial community. The assumption of Professor Glowezesk's project aims to double the habitable land in Egypt and is based on the idea of adaptation to local conditions, on self-help and suitable construction methods.

More recently in doctoral studies, Aiad 1983 [13] and Attia 1984 [12] have each recommended a general plan for Egypt and which is based on the ideas of Dr Ibrahim and Professor Glowezesk. They stress that the population must be dispersed from the existing centres and out over the wider country (Fig (1.18)).

### **Why desert areas?**

Incentives that have encouraged new development in desert areas under the first development plan are, firstly, the idea is to save the fertile land in the valley from urban extension by developing unused desert land for new urban communities; and secondly, that the Egyptian government owns the desert lands except for limited areas which the nomads claim to own. This means that there is no problem of compensation for land acquisition. Thirdly, the installation of services in the desert is easier than in the inhabited areas. At the same time, most of the Egyptian desert has plenty of building materials like sand, limestone, rock and clay which are essential for new development. Fourthly,

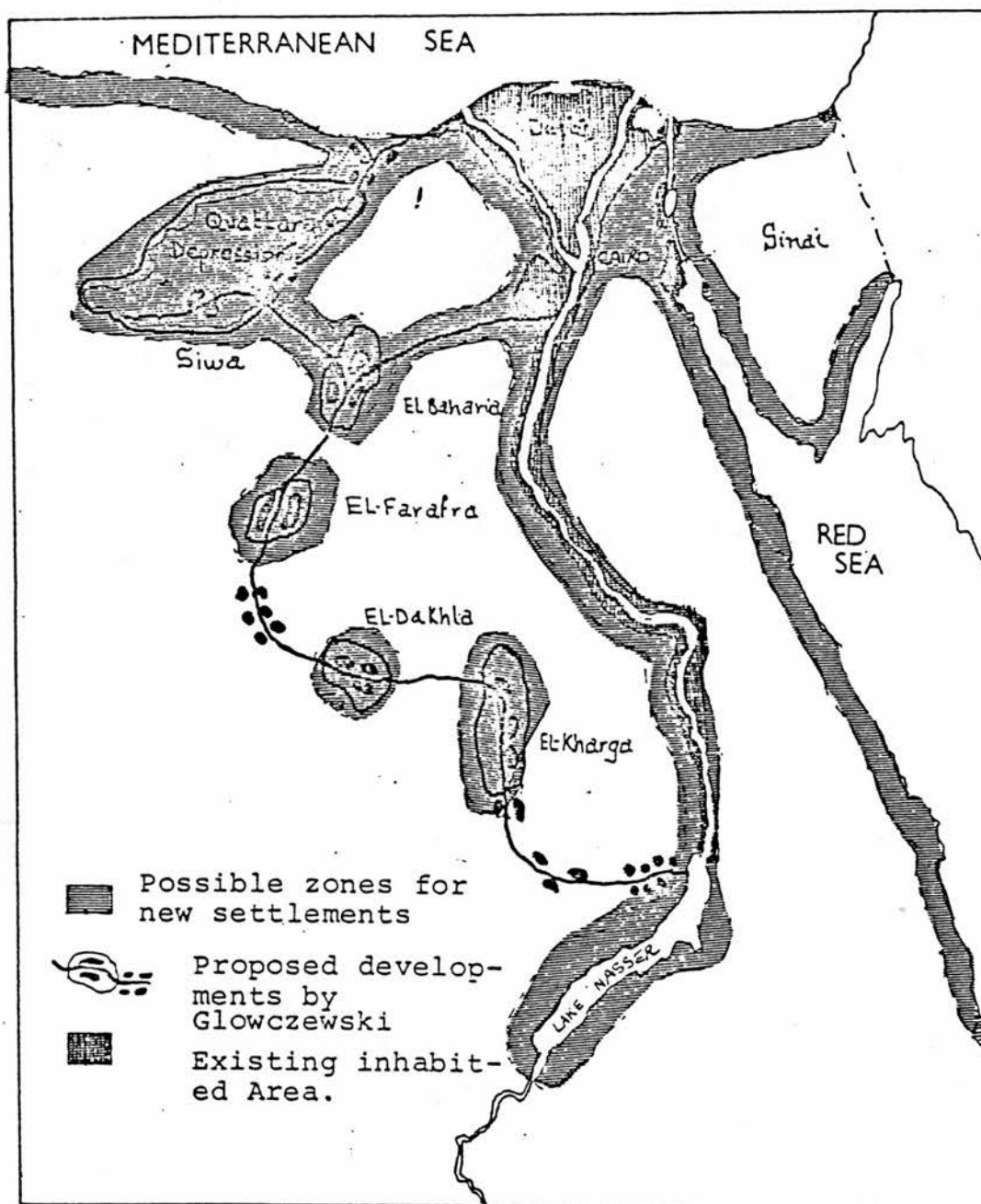


Fig (1.18) Possible location for new settlement (Ayad, M., "Towards a housing policy for Egypt", Ph.D. University of Liverpool, 1983, p368)

there have been successful trials of land reclamation in the Egyptian desert for both agriculture and the establishment of new communities as mentioned previously.

Fifthly, there are the traditional oases of the Western Desert which provide good examples of self-sufficient communities far away from the Nile and which have survived in the desert for thousands of years.

Finally, the potential resources of the desert, such as ground-water, extensive areas available for reclamation, renewable solar and wind energy, mining and petroleum reserves, fishing along the coastal and lake areas, together form a well diversified basis to cater for new desert communities, expanding Egypt to more than the Nile Valley and the Delta.

The Suez Canal, constructed after 1859, and its three cities (Port Said, Ismaillia and Suez) are a good example, ranking amongst those few human artifacts which have brought about major changes in desert areas.

#### 1.7 SCOPE OF THE RECENT PLAN

One of Egypt's main national goals since the war of 1973 has been to develop major new concentrations of urban growth outside the Delta and the Nile Valley, where urbanisation and industrialisation can take place without loss of agricultural land.

In order to fulfill these goals, the Regional Development Strategy was drawn up. Its objectives have been to promote economic and social development for the benefit of the country as a whole by rapid urbanisation and the absorption of population from the overcrowded urban and rural areas of Egypt.

The general plan for the development region is identified by the Government of Egypt as it has been illustrated previously in Fig (1.4) above. This plan has followed the same principle as the proposed general plans above, discussed previously, but the actual practices



started with the most critical regions that need to be developed as follows:

### **Suez Canal region**

The Suez Canal region has been given priority over others so that the area damaged through the years of the war (1967-1973) may be reconstructed. The Suez Canal Regional Plan was proposed in 1976 with the help of the United Nations Programme. The UNDP provided the services of the Development Advisory Group to work on the Regional Plan. International consultants prepared Area Plans for Port-Said, Ismailia and Suez.

The Regional Plan is the framework within which the Area Plans prepared for Port-Said, Ismailia and Suez were to be implemented. It gives guidelines for future investment in the Suez Canal Region as a whole, whereas the Area Plans are primarily plans for the physical growth of the cities and their subregions.

The geographical plan for the development areas covers both the "Inner Region" and a larger "Outer Region". The regional goals for the Suez Canal Region are identical:

- a) Economic development at a high rate to support the growth of the Region and to lead to the economic resurgence of the nation, that is maximum economic growth.
- b) The absorption of people from the overcrowded rural areas of Egypt to give them the chance of a new life, thus assisting in the relief of population pressure on urban centres in the Valley and Delta of the Nile, and at the same time contributing to a better life in the regions from which migrants move by reducing the pressure of population, that is maximum equity.
- c) To become the third urban (metropolitan) region of Egypt helping Cairo and Alexandria in the task of creating national

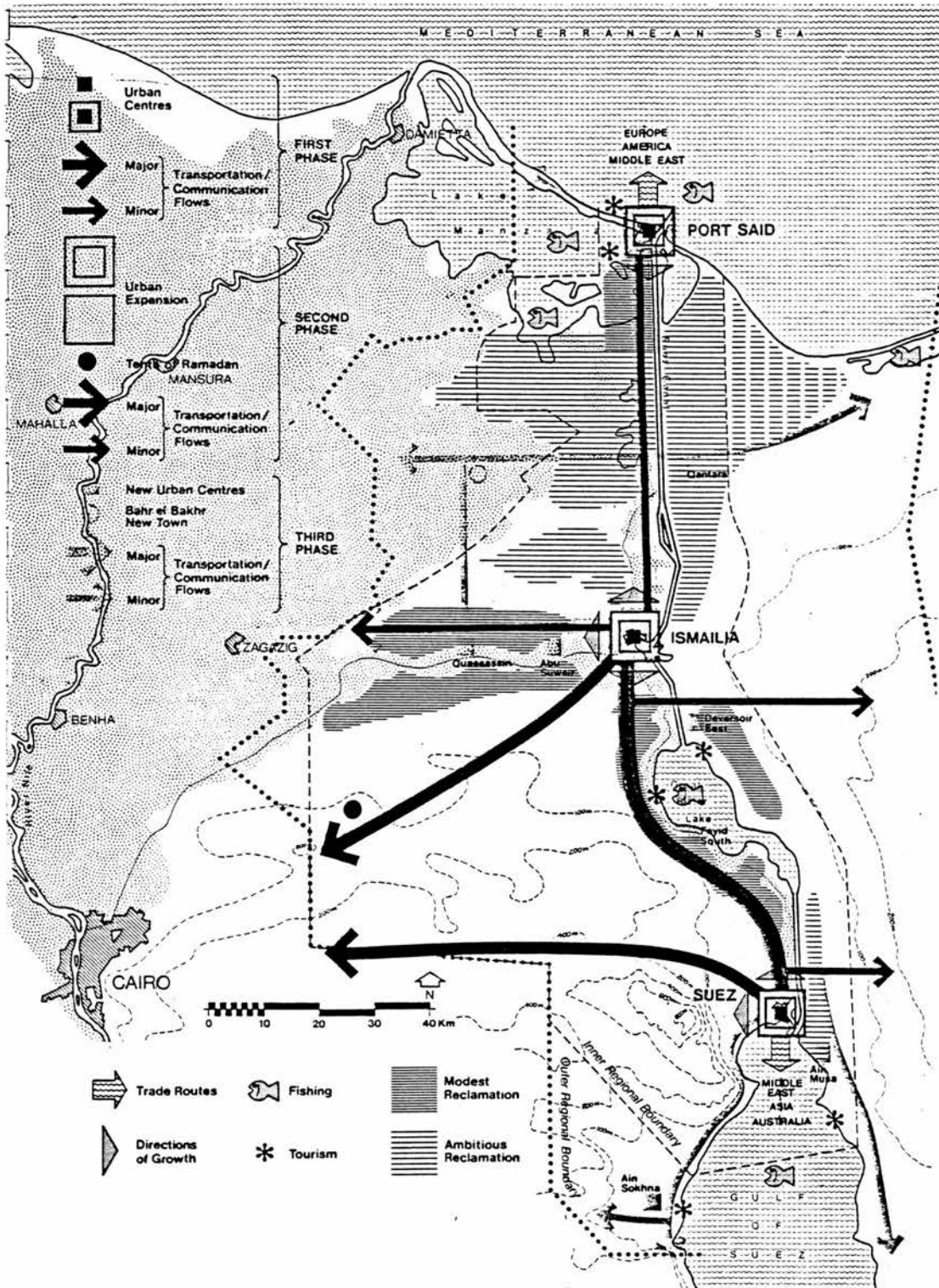


Fig (1.19) Regional development strategy of Suez Canal Region (op.cit. Aiddett, et al., p34).

wealth and accelerating progress towards achieving a modern industrial society, that is maximum geographic relocation [36].

The Regional Development Strategy (Fig 1.19) recommends the rapid development of large cities with distinctive functional roles and excellent accessibility between each other, the Delta and Cairo.

### **Greater Cairo Region**

Priority has been given, after the Suez Region, to the G.C.R. The studies of this Region made in 1968 led to the idea of the establishment of new towns on the desert roads connecting Cairo to the cities of Alexandria and Fayoum in the west and Suez and Khanka in the east (Fig (1.20)).

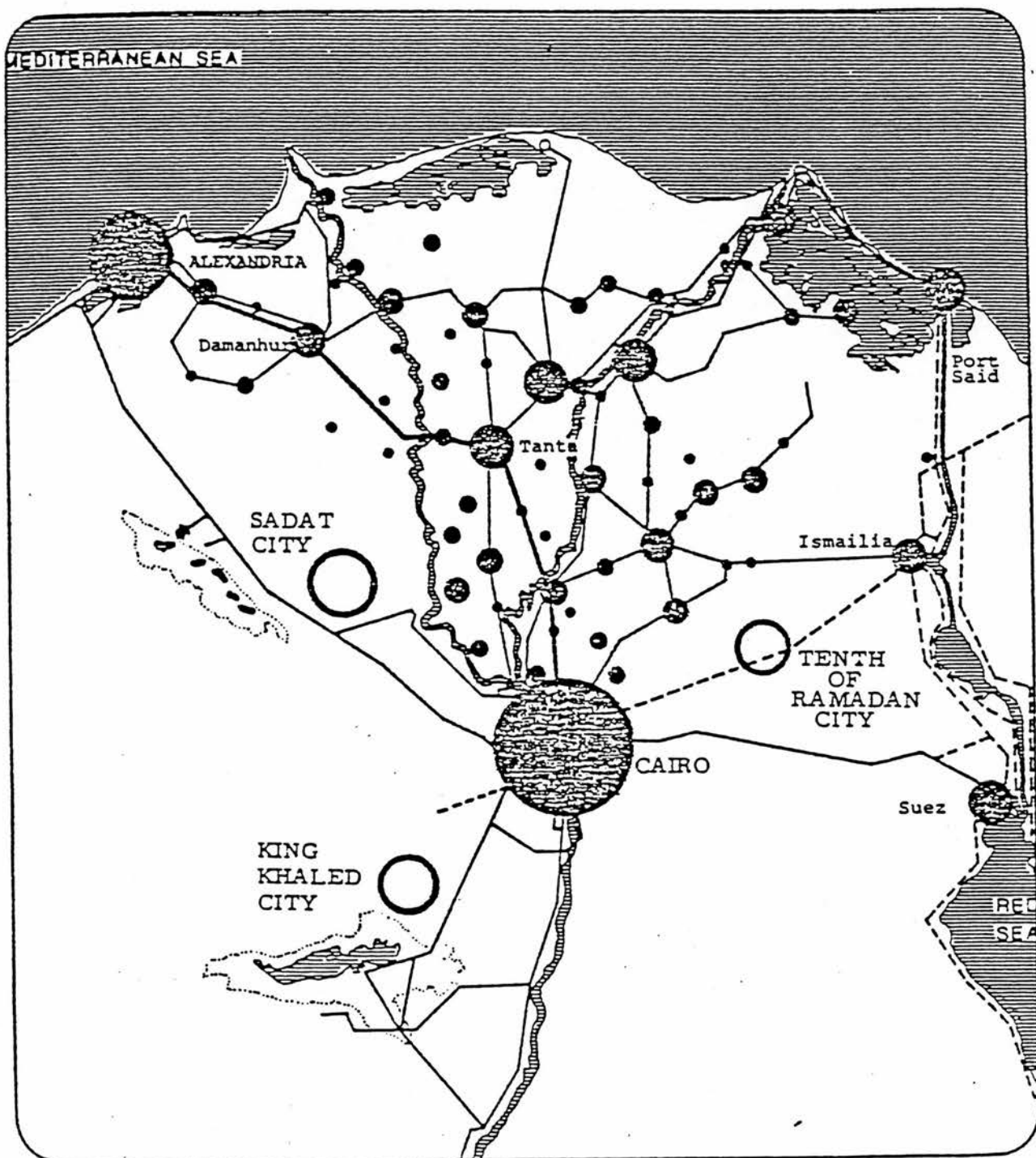
Except for the two cities, 10th Ramadan and Sadat City, to the north-east and north-west of Cairo respectively, no other new towns have been established. In 1979, a decision was taken to build four new settlements (satellites) around the boundaries of G.C.R. using the same argument as that put forward for the old plan, but involving different locations, town sizes and implementation procedures.

Three of the settlements were to be located in the eastern half of the region (Al Salam, Al Obur, Al Amal), one in the west (6th October) and one in the south (15th of May) (Fig (1.21)).

After detailed studies of the four locations, three were accepted by the Ministry of Development (Al Obur, Al Amal and 6th October), while Al Salam had to be temporarily suspended because of safety considerations arising from Cairo International Airport and National Air Defence.

### **The new towns (independent new cities)**

As has been described in the previous sections about Egyptian policy for saving the agricultural land by urbanizing the desert edge



0 10 25 50 100 KM

● exist.  
○ proposed

less than 25,000  
25,000-50,000  
50,000-100,000  
100,000-250,000

250,000-500,000  
500,000  
1,000,000  
2,383,000

7,272,435

Fig (1.20) New Towns Plan around Cairo (Hyland, A. (ed.), et al., Housing in Egypt, Gardo, Newcastle, 1986, p83).

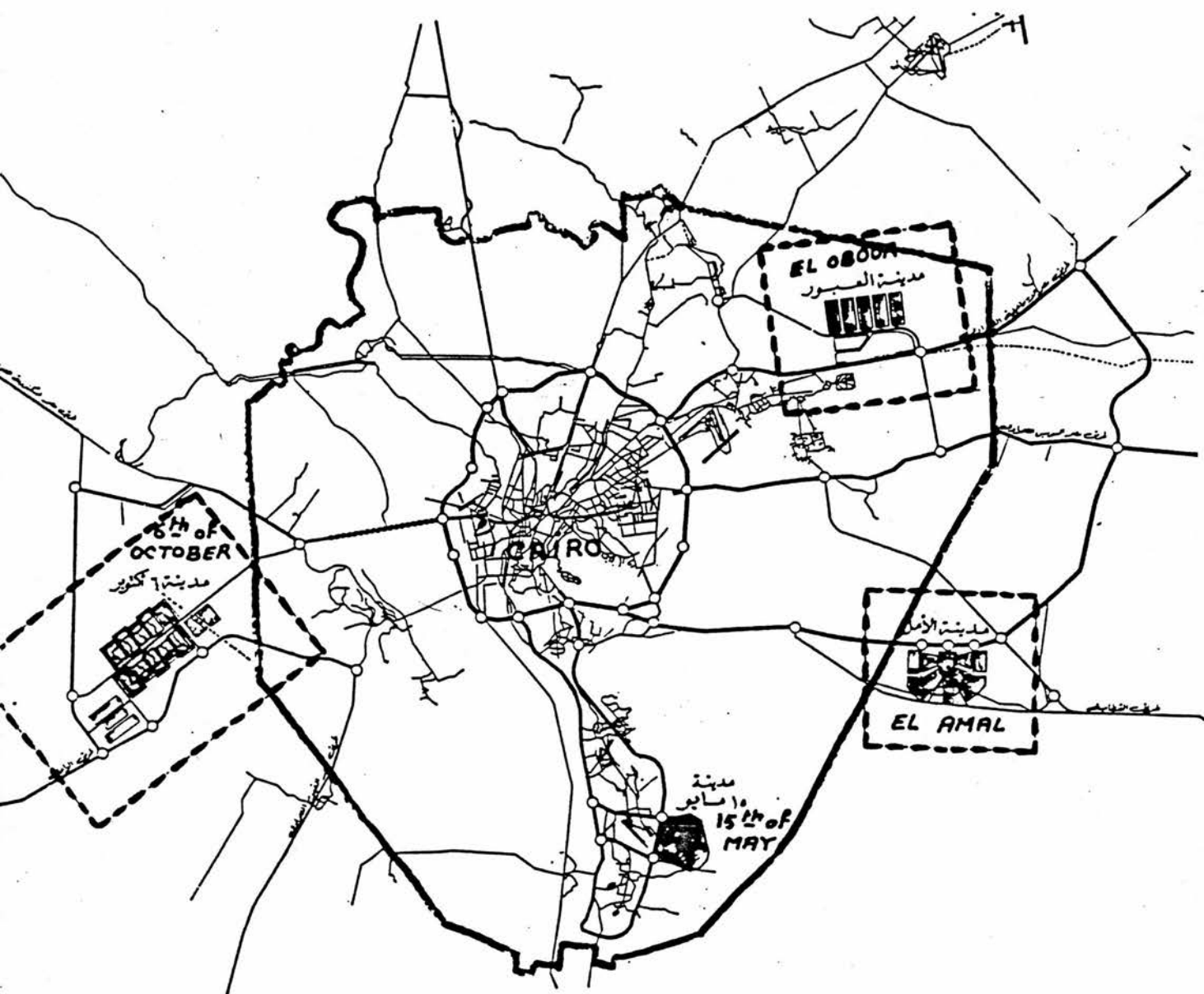


Fig (1.21) New satellite cities in Cairo Region (Chiri, T., "Housing in Egypt", Open House International, Newcastle, Vol. 10, No. 3, 1985, p9).

around the Delta in what is sometimes termed the Capital Crescent Region (extending from Alexandria to the Suez Canal zone with Cairo as the geographical and functional centre (Fig (1.22))), within this framework two new towns have been constructed as self-contained communities in Egypt. The present study will concern itself with this type of independent new city. The two independent cities will be introduced briefly here and then be examined in more detail in the following Part II.

Tenth of Ramadan City was the first of the new cities to be planned. Its implementation was to be carried out in stages, beginning in 1977 and with completion in the year 2000, when the intended target population of 500000 inhabitants should be achieved. The city is located on the north side of Cairo on the Ismailia desert road, about 50 km from Cairo. The Master Plan is illustrated in Fig (1.23). Tenth of Ramadan as an industrial urban project, represents the first attempt to establish a self-contained community in Egypt and an initial step in the National Strategy for urban growth in the desert.

Sadat City is the second independent city after 10th of Ramadan. The city is located midway between Cairo and Alexandria, far enough away from both to discourage daily commuting. Its economic base is mainly industrial, but is supplemented by some government ministries, university research and training centres, a communications centre, recreation facilities and a construction industry. The Master Plan (Fig (1.24)) contains the 25-year plan for Sadat City accommodating a population target of 500000.

### **The "New Towns" debate**

The opinion of those responsible for planning Egypt's future development tends to support either a new town programme or a programme of expansion of existing settlements. On the one hand, the Egyptian authorities support the first option [37] and on the other hand, US



## CAPITAL CRESCENT REGION

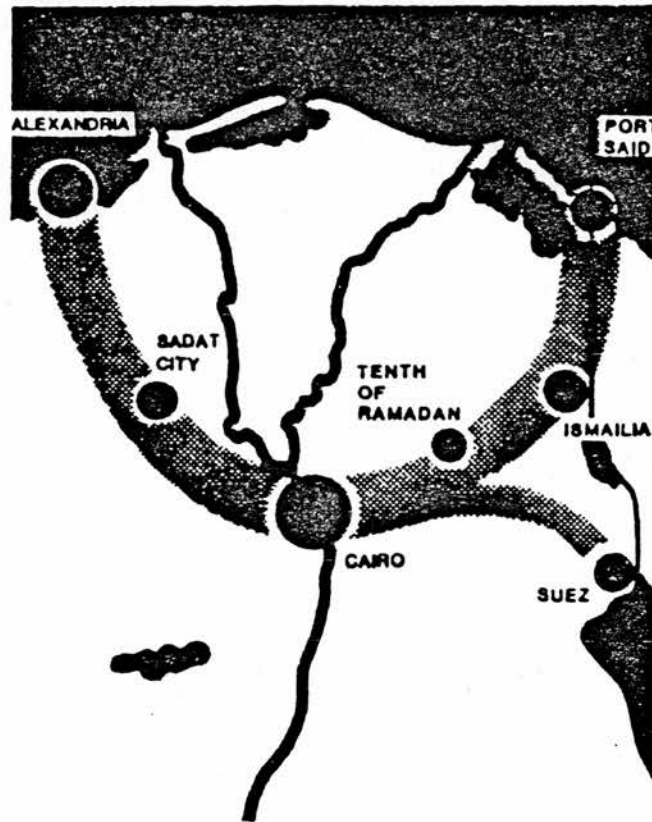


Fig (1.22) Capital crescent region (the area of concern of the re-search); the E.N.T. main task is to develop the unused desert land in the periphery of the Delta (Ibid, p8).



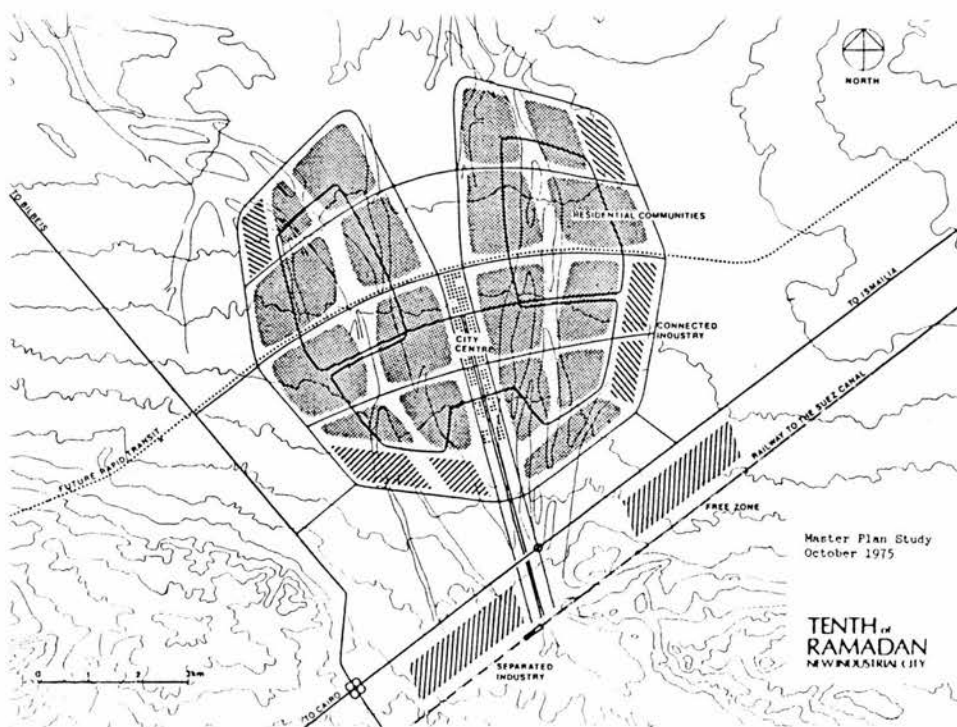


Fig (1.23) Master Plan of Tenth of Ramadan (op.cit., SWECO, 1977, p3).

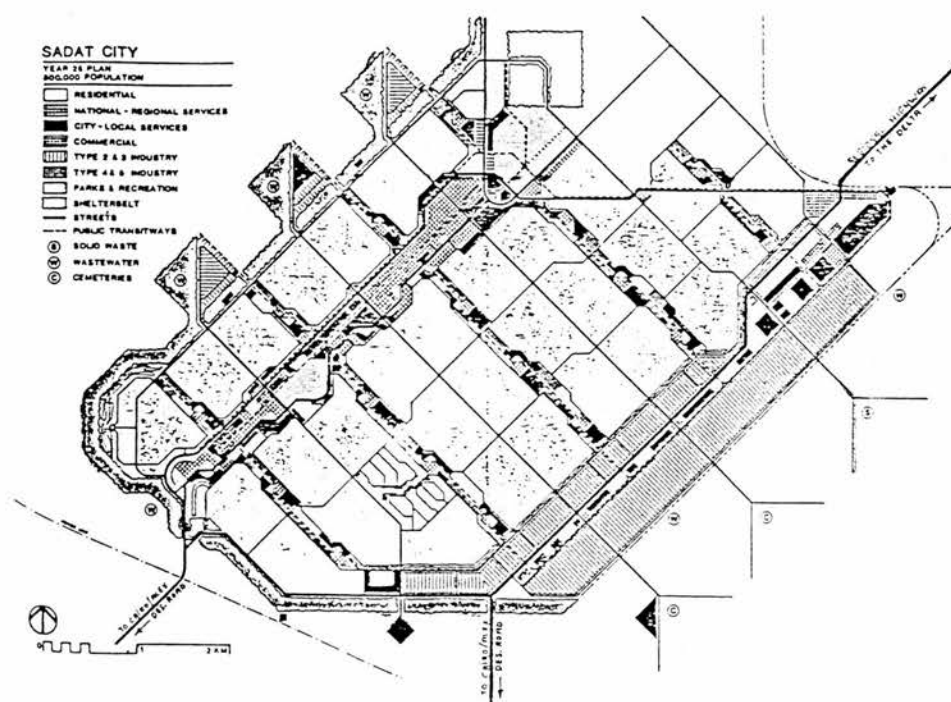


Fig (1.24) Master Plan of Sadat City (op.cit., Open House International, p55).

officials of the Aid Programme and World Bank support the development of existing cities [38].

A recent study has been made by Attia, 1984 [39]. He mentions that the population increase in Egypt cannot be accommodated only by the extension of existing settlements, because in most cases it would be at the expense of the cultivated land which surrounds these existing settlements. At the same time the present urban services are already overloaded and extra demands will lead to the collapse of such services with consequent economic, social and health deficiencies.

Therefore, urban development should be carried out away from the existing inhabited settlements, but close to land with potential especially for agriculture which is the primary occupation of the majority of the people. He writes "A realistic new settlement programme to solve the existing urban problems in Egypt should be at least 9-10 times the size of the present programme".

In general, in a poor and densely populated country like Egypt where most of the people are engaged in agriculture and where arable land is limited, it is logical for the first priority in a development policy to be given to agricultural projects for reclamation of semi-fertile lands and the construction of new settlements near the newly opened areas. However, it is clear that this policy is not enough to solve Egypt's overpopulation. There should also be a development policy for the existing facilities in cities and villages to provide more varied job opportunities and a better way of life.

#### 1.8 THE IMPORTANCE OF THE STUDY

There is no doubt that there is a great need for a New Town policy to satisfy the needs of Egypt's growth. The Egyptian New Town policy is planned to accommodate an extra 5 m people by the year 2000. The total projected cost of the programme up to the year 2000 will reach E£5.8 bn

(\$4.3 bn). Spending had reached E£1.5 bn by the year 1985 [40].

These figures show the scale of the new desert towns project and how it will affect the overall strategy for Egypt. The general aim is to create a new atmosphere of integrated life in Egypt on the desert land beyond the cultivated area of the Nile and its Delta in order to attract people from the overcrowded valley. Any attempt to attract people from the lush green Nile Valley to these desert new towns will not be an easy task. It should be noted here that a similar migration had been occurring naturally (but in reverse direction) 6000 years ago when the Sahara wet phase was drawing to a close during the later Neolithic age. The ancient Egyptians migrated from the harsh environment in the desert area to the wet environment in the valley. The recent direction of migration is from a favourable environment to an unfavourable desert environment. Therefore, psychological factors must be taken into account, these being of great importance for the success of new settlement establishment involving people who used to live close to the Nile. Indeed, the settlers' perception of the surrounding environment appears to be a critical factor in the success of these new desert communities.

For this reason, sufficient care must be directed to the character of open space, the landscape and greenery provision in the new desert settlements to realise their success and to combat the feeling of the surrounding desert.

### **Landscape design problems**

It is evident that the Egyptian New Towns Policy lacks a proper understanding and application of landscape principles and concepts compatible with environmental dictates. In other words, there are some crucial problems with regard to these new towns. As Professor Youngman says "There are plenty of examples in the Middle East of designs (for

buildings, open space, urban neighbourhoods, roads, etc) derived directly from European styles and standards, utterly inappropriate to the climate and traditions of these arid Arab countries" [41].

This is a fact true of the existing situation in Egypt, where most of the new towns have plans based, like many European new towns, on neighbourhoods defined by intended park ways and containing their due proportion (according to post-war western standards) of space intended to be green as well as open. However, in Egypt such spaces remain dry, dusty and without vegetation. At the same time, the buildings seem to be afloat in a sea of space rather than containing it. A. G. Tipple says "Tower blocks separated by wide streets are a very bad urban form from the point of view of thermal absorption. It is most unfortunate that so much of the recent architecture in Egypt is of this type" [42].

Generally the Egyptian New Towns are not in harmony with local physical characteristics; they do not suit the inhabitants, their culture or their traditions. (This will be discussed in more detail in Chapter 2 - 2.7 Culture.)

Western ideas of landscape design have been applied in these new towns demanding the creation of a completely new environment, but in fact nothing has resulted. It seems, therefore, that the landscape concept of the E.N.T. has remained a theoretical paper exercise and has not fulfilled its object.

What is the situation regarding the landscape design of the Egyptian New Towns now, and what approach should be adopted for further new development in the desert areas? The discussion of and answers to these questions is one of the aims of this study. An appraisal of existing landscape concepts will therefore be made to identify the main problems with a view to improving them. Finally, a proposal for an appropriate landscape for urban expansion in the Egyptian Desert will be made.

## Notes and references:-

- [1] SAID, R., The Geology of Egypt, Elsevier P.C., Amsterdam-New York, 1962, P8.
- [2] HYLAND, A. (ed) et al, Housing in Egypt, Cardo, Newcastle, 1986, P3.
- [3] SAID, R., Opcit, P8.  
CHIRI, T., "Housing in Egypt - a preliminary overview", Open House International Vol 10, No. 3, 1985, P6.
- [4] GOWERS, A. "Egypt, the country's population growth", Financial Times, June 27 1988, P10.
- [5] TIPPETTS, et al, Suez Canal Regional Plan, M.H.R., 1976, P15.
- [6] HYLAND, Opcit, P3.
- [7] TIPPETTS, et al, Opcit P20.
- [8] ATTIA, Y., "A new settlement policy for Egypt" PhD University of Liverpool, 1984, P54.
- [9] HYLAND, A., et al, Opcit, P3.
- [10] TIPPETTS, Opcit, P15.
- [11] BLUNDY, D., "Egypt on the brink", Sunday Times, August 8 1988, PP18-23.  
- The Economist, "The riot-stoppers riot", March 1 1986, PP36-37.
- [12] LETTER I, "Egypt, a case of ecological vulnerability", Letter The Conservation Foundation", August 1983, P4.
- [13] ATTIA, Y., Opcit, P74.
- [14] JULY, R., "A history of the African people", Faber, L., London, 1970, P9.
- [15] EL HADIDI, N., "Food plants of prehistoric and predynastic Egypt, Wichens, G. (ed), Plants for Arid Lands, George Allen & Unwin, London, 1985, P56.
- [16] JULY, R., Opcit, PP28-30.

- [17] NEWTON, N., Design on the land, Harvard College, U.S.A., 1971, P1.
- [18] JAHN, G. "The old city: Coptic coexistence", USA International Architect "An introduction to Islamic Cairo, Issue 7, 1885, P32.
- [19] JAHN, G., Ibid, P4.
- [20] JULY, R., Opcit, P37.
- [21] WERKMEISTER, H., "The perfect way to Tut ank-amum" (IFLA, Year Book), Clasen & Bosse, Postfach 1985/86, P183.
- [22] ATTIA, Y., Opcit, P29.
- [23] HELMI, R., "Greater Cairo Region" (IFLA, Year Book), 1985/86, P161.
- [24] Opcit WERKMEISTER, H., P185.
- [25] AL AHAM INTERNATIONAL, London, 29 September 1987, P5.
- [26] ALLAM, K., "Regional and urban planning of greater Cairo", IFLA Year Book 1985/86, P165.
- [27] LETTER II, "Cairo: a Third World city in growing trouble", Conservation Foundation, September 1983, PP1-5.
- [28] LETTER II, Ibid, P6.
- [29] ZUBE, E., "A cultivated dislike for the Egyptian desert", Landscape Architecture, November/December 1983, P84.
- [30] EL BAZ, Bishay Opcit, p78. p345
- [30] "Werkmeister, H., "Mudiriya Al Tahrir", Garten & Landschaft", Nov., 1979,
- [31] CHINA, "Chinese experiment", Sunday Times", July 1986, P21.
- [32] LETTER II, Opcit, P7.
- [33] Ibid, P8.
- [34] KARIM, I., "Towards a general plan for Egypt and effect on the landscape of the cities in the Nile Valley", IFLA Year Book, 1985-86, PP174-175.
- [35] ATTIA, Opcit, P37-38.
- [36] TIPPETTS, et al, Opcit, PP25-36.
- [37] WALKER, T., "Nightmare for Egypt's urban planner "new towns", Financial Times, 27 August 1986, P6.

- [38] GILLESPIE, W., "Masterplan studies for the Suez Canal Region",  
Landscape Design, May 1976, P17.
- [39] ATTIA, Opcit, P258.
- [40] WALKER, T., Opcit, P6.
- [41] YOUNGMAN, G., "Foreword" "Landscape design for the Middle East",  
Cochrane, (ed)et al, London, 1978, P5.
- [42] HYLAND, A. (ed) et al, Opcit, P95.



## Chapter 2: Regional landscape factors

### INTRODUCTION

Regardless of whether socio-economic considerations suggest the establishment of new towns, the selection of land suitable for urbanization should depend on an assessment of its fragility and its value for other uses.

The fragility of landscape is a function of geology, soil, slope, climate, vegetation, wildlife and of their complex interactions and their effects on landscape itself. The values given to landscape as a resource are never absolute but are those of particular societies at particular moments in time.

Clearly the ability to make decisions based on criteria of fragility and value depends fundamentally on understanding the evolution of landscape and the essential elements of environment and the basic natural processes and ecological interrelationships [1].

Therefore, this chapter attempts an understanding of the natural regional processes that constitute and have formed the landscape of new desert communities. Such an understanding of the basic elements of the Egyptian desert environment should help to produce better solutions for the landscape design problems of these new communities.

"In reading the landscape, we should first look at the larger regional landscape. This ensures an understanding of our landscape as a logical system without becoming bogged down in specific details" [2]. In spite of the fact that research is primarily concerned with the new towns' scale, it is very important to understand how these new towns fit into the larger landscape. Therefore, this chapter represents the general character and evolution of the desert landscape where the Egyptian New Towns are located. It consists of an examination of the main fac-

tors which determine the land capability and which interact to produce the regional landscape. These include:

- a) Physical factors:
  - Geology
  - Hydrology
  - Soil
  - Climate
- b) Biological factors:
  - Plants
  - Wildlife
- c) Ecological factors
- d) Human social factors

Each will be examined, firstly as a factor of a natural system; secondly with respect to how it effects or changes the landscape features, the purpose being to identify determinants and principles which should be kept in mind for any planning or design project in arid areas. These determinants and principles will be used as criteria in the appraisal of the site characteristics of the case studies. These criteria could be considered in terms of their being limitations for development, as they are commonly understood. Conversely, we could well consider them as opportunities for various land-uses, as they should be.

At the completion of this part, an understanding of landscape at the regional scale will have been founded. This is an essential prerequisite to smaller scale site planning and detailed landscape design (Parts II and III).

## 2.1 GEOLOGY

### 2.1.1 Introduction

The geography of Egypt is not homogeneous so it cannot be treated as a single unit. The landscape of the various areas has so many

factors in common that a certain logic arises by taking these factors together particularly in the context of the arid climate (desert area) which presents special problems in horticulture.

This part aims to represent the geological evolution of Egypt by giving a broad outline of topographical character, geomorphology and geology. This will also include the major geomorphological factors affecting the E.N.T. sites.

Geographically, Egypt is situated between latitudes 22 and 32. It forms the north-eastern corner of Africa and occupies nearly one-thirtieth of the total area of that continent; it measures 1073 km (N/S) in greatest length, 1226 km (W/E) in greatest breadth, and embraces a total area of almost one million sq km (Fig (2.1)). The River Nile is the dominant water resource, its water coming from the highlands lying far to the south and flowing through the Nile Valley to be channelled by artificial canals over the narrow strips of alluvial land on both sides of the river. Fertile land composes less than 3% of the total area of Egypt and it supports a dense population. The Nile, a perennial water body, makes its way over thousands of kilometers of desert to the Mediterranean. It divides Egypt into two distinct geomorphological regions; the region to the east consists of a dissected plateau draining into the river, while the region to the west consists of a series of unconnected depressions. The region to the east is divided geographically into the Eastern Desert and the Peninsula of Sinai, separated by the Gulf of Suez.

It has been the custom, therefore, to deal with Egypt geographically as divisible into the following regions [3]:

- The Nile Valley and Delta
- The Western Desert
- The Eastern Desert

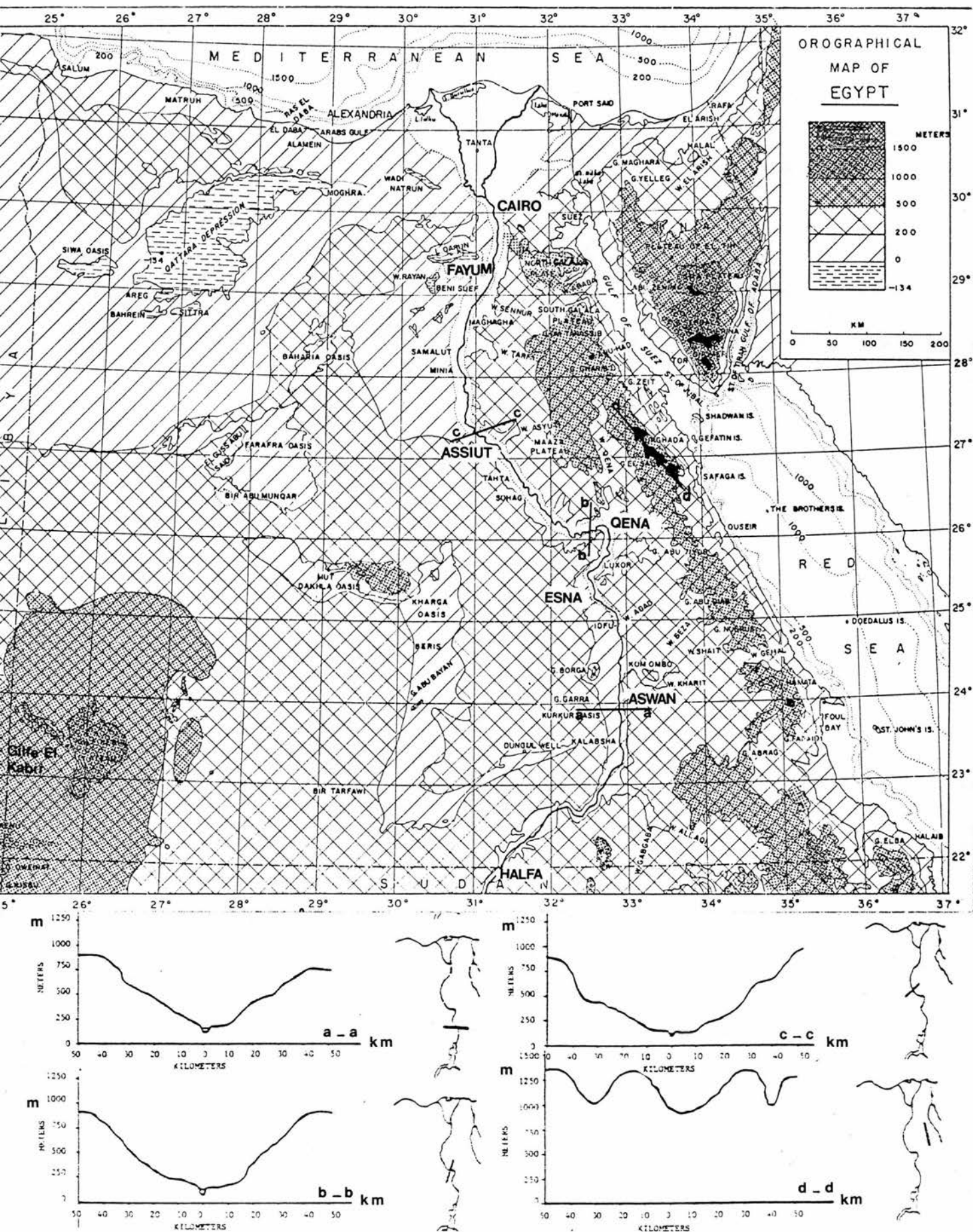


Fig (2.1) Orographical map of Egypt and selected cross sections (Said, R., *The Geology of Egypt*, New York, 1962, p10) and (Golay, G., "Arid zone settlement site selection: the case of Egypt", *Eistics*, 291, Nov./Dec., 1981, p464).

- The Sinai Peninsula

2.1.2 Topographical characteristics and geomorphology

**Nile Valley and Delta**

The Nile Valley and Delta occupy the alluvial tract along the terminal 1530 km of the River Nile. The Nile crosses the upper part of Egypt (Fig (2.1) above) flowing 300 km through a narrow valley surrounded by cliffs of sandstone and granite, until it reaches the first cataract 7 km south of Aswan. Before the Aswan High Dam was built, at the time of flood the gradient height of the water surface in this stretch varied from 125 m above sea level at Halfa to 92 m above sea level at Aswan (1/11). North of Aswan (Fig (2.1) a-a), the Nile Valley broadens and the flat strips of cultivable land, extending between the river and the cliffs that bound the valley on either side, gradually increase in width northward. Near Esna, the sandstone of the cliffs bounding the valley gives way to limestone; at Qena (120 km north of Esna), the river makes a great bend bounded by limestone cliffs rising to a height of more than 300 m (Fig (2.1) b-b). Near Assiut (260 km north of Qena), the cliffs of the western side of the valley become much lower than those on the eastern side (Fig (2.1) c-c) and continue so for more than 400 km to Cairo, where the valley opens out into the Delta. Through this area west of the Nile Valley there is the Fayum depression covering a total area of 1700 sq km. This depression is connected by a narrow channel through the desert hills. Its floor slopes downward in a north-westerly direction from a level of about 23 m above sea level to the lake which lies at 45 m below sea level. This floor consists of rich alluvial land [4].

The average width of the flat alluvial floor of the Nile Valley between Aswan and Cairo is about 10 km and that of the River itself is about 3/4 km. Fig (2.2) shows the typical landscape of the Nile



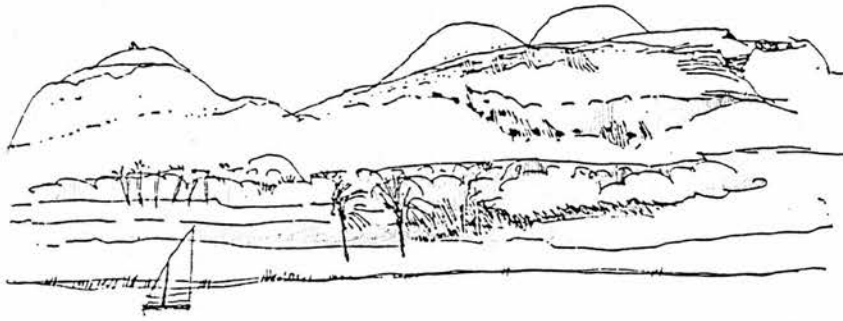


Fig (2.2) Typical landscape of the Nile Valley "Upper Egypt" (Olschowy, G., "Tourism and Landscape", IFLA Year Book, 1985/86, p185).

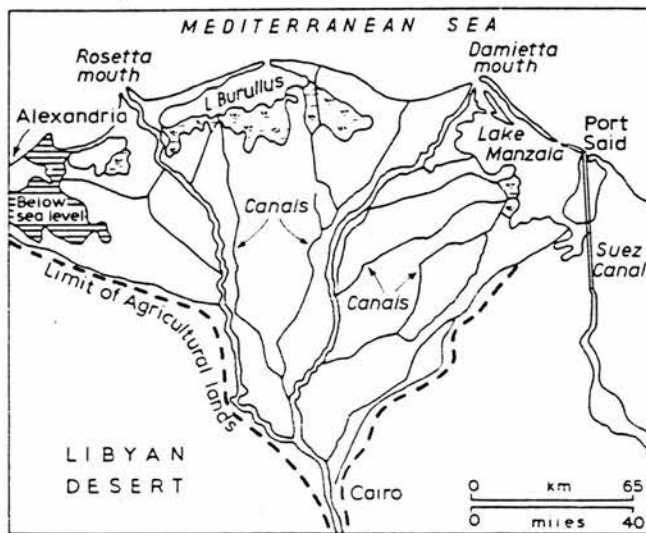


Fig (2.3) The Nile Delta (Sawyer, K., "Landscape Studies, An introduction to geomorphology", London, 1970, p28).



Valley in upper Egypt.

After the Nile reaches Cairo, it pursues a north-westerly direction for about 20 km, and then divides into two branches, each of which meanders separately through the Delta to the sea. The western branch (239 km in length) debouches into the Mediterranean at Rosetta, and the eastern (245 km in length) at Damietta.

The upper part of the River Nile could be considered as a river in its Middle Course. The phenomena of Springs and Gorges are represented in the first part south of Aswan. The river produces friction which leads to vertical and horizontal erosion. Through the upper part, the Nile almost washes the eastern boundary cliffs and deposits on the other side so that the cultivable lands on the west of the river are generally much wider than those on the east. After the Aswan High Dam had been built and the water level was controlled, new marginal terraces were formed below the cultivated level.

In its lower course, where the Nile is traced to the sea, it can be seen to widen and merge with the sea in an estuary. As a result of the lower density of the river water, it flows over the surface of the sea, moving quite freely forward but slowly spreading out sideways. At the edges of such a flow, the river water is checked and its load deposited. Thus the Nile Delta was formed, having an accurate shoreline and a triangular plan (Fig (2.3)). Nowadays, as a result of the High Dam, there is no accumulation of mud from the Nile near the shoreline and the sea has started to advance towards one of the main cities, Rosetta, covering the shoreline at a remarkable figure of 10 meters per year.

### **Western Desert**

The Western Desert stretches from the Nile Valley to the borders of Libya and covers an area of about 681000 sq km. It is essentially a plateau desert with vast, flat expanses of rocky ground and numerous



extensive and deep closed depressions.

Southward, there is the extensive sandstone plateau of Gilfe El Kebir, nearly 1000 m above sea level (Fig (2.1) above). From this plateau the ground slopes gradually to the depression in which the Oases of Abo Manger, Dakhla and Karga are situated. Northward, an Eocene limestone plateau took the place of the first plateau. This plateau rises 500 m from sea level and forms the dominant feature of the desert west to the Nile for about two-thirds of the length of Egypt. In this limestone plateau are situated the great hollows containing the Oases of Farafra and Baharia. North-west of Baharia the ground gradually falls towards the Siwa Oases and the Qattara depression, where it descends far below sea level. To the north-east of Baharia the plateau rises again forming the promontory of Gabal Qatra in overlooking the Fayum depression from the north-west.

The northern limit of the Siwa group of the Qattara depression and Oases is formed by an important escarpment stretching over 300 km to Moghra and marking the southern edge of a great plateau of Miocene limestone about 200 m above sea level which extends north-westwards to the Mediterranean. The Sadat New Town is located in the north-east part close to the Nile Delta border.

The main characteristics of the Western Desert are due to its arid climate; there are a few gullies draining from its northern edge to the sea and on the east along the Nile Valley. The Oases are situated in a great depression where the ground water supplies can rise to the surface. Another characteristic is the occurrence of parallel belts of sand dunes running generally in a south, south-easterly direction. Besides these dunes, there are extensive flat expanses of drifted sand especially in the south and west. However, the total area covered by sand in the Western Desert is, in fact, less than that occupied by bare

rock [5].

The Western Desert is a rock platform of low altitude which has been characterized through its recent history by arid climatic conditions. The geomorphological features are primarily due to wind action.

The origin of the depressions has been the subject of controversy for a long time. Most authorities seem to agree in one way or another with Ball's contention that these depressions are the result of wind action. Another opinion by Ibrahim is that the origin of the depressions was tectonic [6].

### **Eastern Desert**

The Eastern Desert extends from the Nile Valley eastward where 10th of Ramadan is located (north part), to the Gulf of Suez and the Red Sea. It consists essentially of a backbone of high and rugged igneous mountains running parallel to the Red Sea coast. These mountains do not form a continuous range but rather a series of mountain groups with some detached masses and peaks and are flanked to the north and west by intensively dissected sedimentary limestone plateaux (Fig (2.1) above).

To the north, extensive and lofty limestone plateaux extend along the Gulf of Suez. They comprise South Galala (1464 m), North Galala (1273 m) and Gabal Ataq (871 m), which are separated from each other by a broad valley (Fig (2.1) d-d) and further south beyond the mountains by a lower ever-broadening sandstone plateau extending beyond the Sudanese frontier [7].

The Sinai Peninsula has a triangular shape and covers an area of 61000 sq km. It extends from the Suez eastward to the Gulf of Aqapa and the Palastine border. Northwards is the Mediterranean coast. The core of the peninsula is situated near its southern end, consisting of an intricate complex of high and very rugged, igneous and metorphic mountains, their height reaching to 2586 m above sea level. The northern

part (two-thirds of the peninsula) is occupied by a great northward draining limestone plateau which rises to 500 m from the Mediterranean coast. In the northern part, extending nearly to the Mediterranean coast, is a broad belt of sand dunes [8].

The most pronounced geomorphological feature of the whole Eastern Desert (including Sinai) is its dissection by valleys and ravines. While eastward drainage of the highlands to the Red Sea is by numerous independent wadis, the westward drainage to the Nile Valley mostly coalesces into a relatively small number of great trunk channels [9].

The arid climate forms its character but it is probably less inhospitable than the Western Desert. The mountainous areas have received more moisture than other areas.

### 2.1.3 Geological map of Egypt

The geological map of Egypt is based both on mapping rock stratigraphic units and also on time rockunits. Geologically, Egypt may be divided into basement rocks and deposit rocks.

The igneous and metaorphic rocks form the most rugged mountainous portion of the country and include the Sinai mountains and the mountains of the Red Sea (Fig (2.1) above). These rocks appear in the southern part of the Western Desert, where they outcrop through the Nubian sandstone plateau. They are succeeded by schists which must have originated as greywackes, mudstone, pelite and carbonate members in a geosyncline [10].

The sedimentary columns that rest over the pre-carboniferous basement complex is of the following lithological division [11].

- Upper clastic division; Oligocen through Recent predominantly clastic but with organogenic limestone.
- Middle calcareous division; Cenomanian to top of Eocene predominantly calcareous.

- Lower clastic division; Pre-Cenomanian predominantly clastic with interfingering calcareous sediments.

A sequence of the geological sections has been made by a Joint Consultant who studied the area around Cairo for the new towns plan. These sections are illustrated in Fig (2.4).

#### 2.1.4 The major geomorphological factors

From the previous part it is clear that, in arid areas like Egypt, it is comparatively recent erosional forces rather than the type and form of bedrock which determines the existing landscape characteristics [12]. It should be noted that there are some interacting climatic factors which have helped to form the landscape in desert areas where most of the Egyptian New Towns are located. These factors have the greatest significance for the development of desert landscape either by degradation or accumulation.

Wind is one of these factors. It has a great effect on the process of denudation and landforms occur which are characteristic of arid areas. More importantly, the absence of vegetation means that above the ground there is nothing to reduce wind velocity over the surface, and below the ground there are no root systems to bind the soil particles together. At the same time there is no soil moisture near the surface to give coherence to the particles.

The wind action affects the desert surface both by degradation and accumulation. The desert surface is exposed to intense heat during the day, and to cold temperatures at night, gradually becoming pulverized into smaller and smaller particles. When the wind blows across such a surface, it picks up the dust and sand grains and, having lost the cover of loose matter, the surface is open to further erosion and weathering.

The degradation processes by which wind moves surface particles are as follows. The small particles (dust = less than 0.2 mm) may be

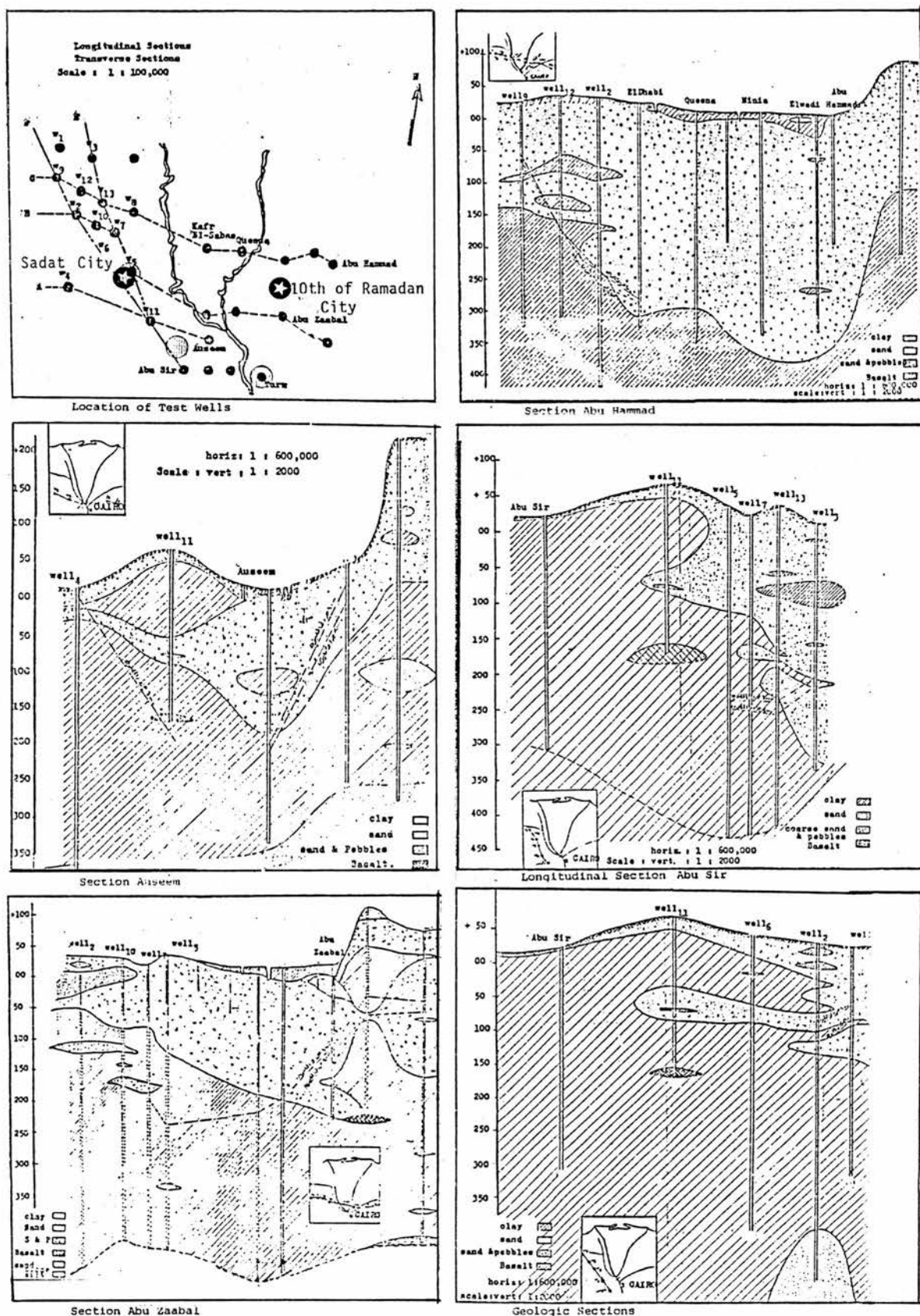


Fig (2.4) Geological sections around the E.N.T. areas (Joint Con. "Development of Salam Oasis", 1st Draft Report, Cairo/ Stuttgart, 1978, pp38-40).

carried freely for long distances and up to considerable height by the wind. This phenomenon may have a great effect on the environment of desert new towns. Grains of larger size than this are moved in a series of jumps. The height and the length of each forward bound will vary with particle size and wind speed, but the average is 2 m above the surface (Fig (2.5)).

In view of the foregoing facts, it must be clear that any erosion by wind, or more accurately by sand grains carried by wind, must be limited to within at most 2 m of the surface [13].

Of the various surface types found in the desert, stone is one of the most common characteristics in all the E.N.T. sites. The true stone pavement consists of armoured surfaces of rock fragments, either angular or rounded, usually only one or two stones thick, set in matrices of finer material such as sand, silt or clay (the local name is Hammada or Reg). The wind removes the fine materials from deposits of mixed grain size. This would tend to leave the coarse contents as a lag or residue at the surface [14] (Fig (2.6)).

Accumulation is the other significant action of wind. The accumulation of sand occurs in association with marked surface irregularities such as large boulders or escarpment gaps (Fig (2.7)). This accumulation is known as sand shadow or sand drift, and it may be changed in size and shape, perhaps even completely removed if the wind speed, duration, and/or direction changes. Dunes are considered a very characteristic depositional feature of sand covered deserts. These dunes exhibit a tendency towards a crescentic plan. They begin to form when sand of a suitable size (0.5 mm to 0.125 mm) collects in piles larger than a critical height of about 0.3 m. In Egypt, sand dunes cover 16% of the total area of the region (Fig 2.8) and they are considered one of the serious problems which affect the new reclaimed desert areas (Fig



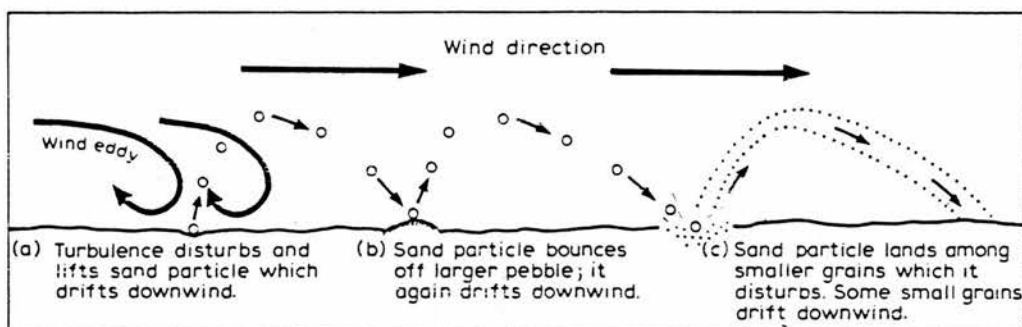


Fig (2.5) Downward movement of sand grain (Sawyer, K., op.cit., p96).

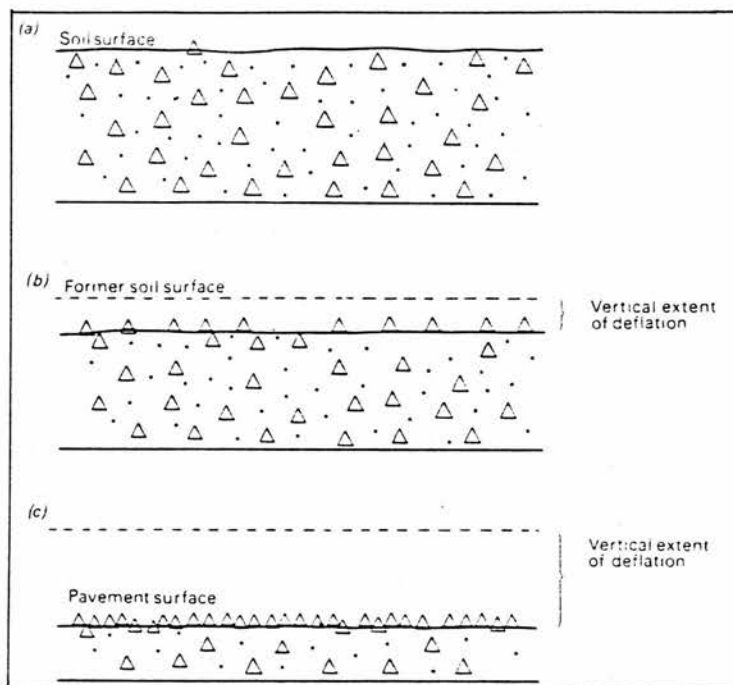


Fig (2.6) Hammada Pavement surface degradation (Godie, A., et al., "The Warm Desert Environment", Cambridge Uni., 1977, p14).

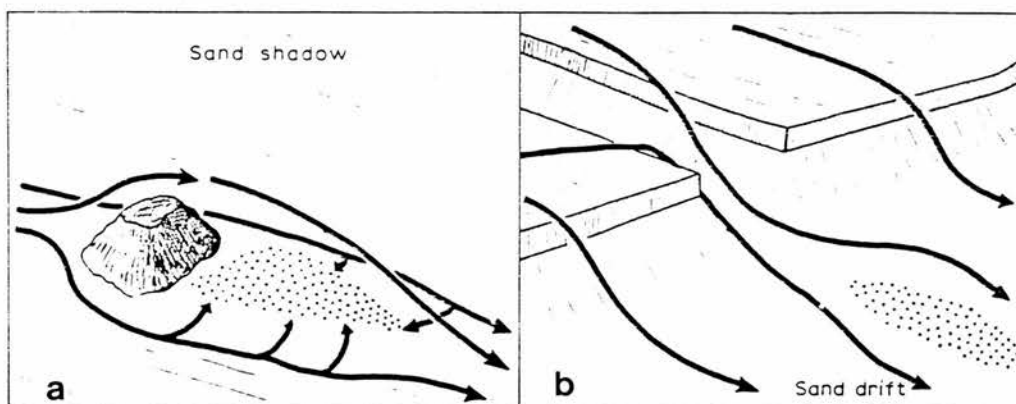


Fig (2.7) a) Wind blowing over and around an obstacle, depositing a "sand shadow" on the lee side.  
b) Sand drift deposited as wind spreads out after being concentrated in a valley.  
(Sawyer, K., op.cit., p97).



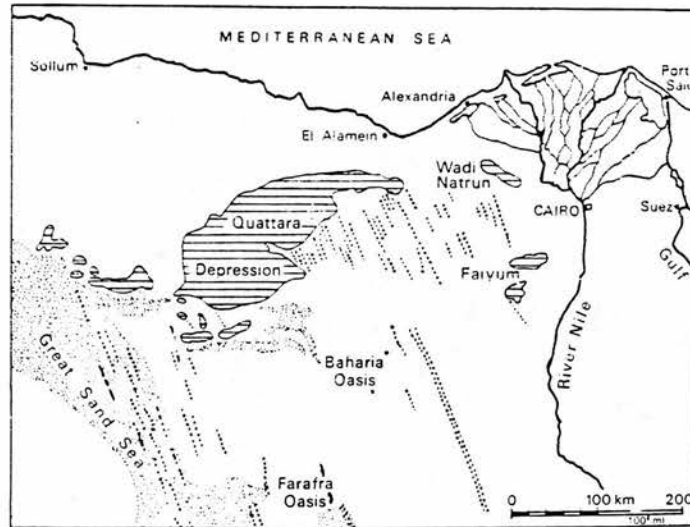


Fig (2.8) The accumulation of sand in the Egyptian Desert (Blyth, F., et al., "A Geology for Engineers", London 6th Edition, 1974, p34.



Fig (2.9) The sand dune covers the palm tree grove area "North Sinai", (Monir, M. (ed.), "The sand dune in Egypt", Desert Institute, Cairo, 1983, p61 (Arabic).

(2.9)). Soil fertility and crop production are threatened by sand storms, and the amount of sand deposited monthly in certain areas is estimated at 75 tons per square mile. The sand dunes endanger villages, roads and in some cases cause loss of urban areas [15].

The sand constantly moves up the windward slope and falls down the lee slope ( $34^\circ$ ) (Fig (2.10)). As a result the dunes move with wind direction, the rate of this advance being in part dependent on size [16].

- A dune 3 m in height advances about 18 m/year.
- A dune 18 m in height advances about 10 m/year.
- A dune 30 m in height is nearly stationary.

The movement of the Kharga Barchan dunes has been measured and found to vary between 20-100 m per year [17]. Different types of sand dunes are shown in Fig (2.11).

The weathering effects of infrequent torrential desert rains have a very important influence on the landscape and must be considered in desert areas; namely the fact that lack of precipitation combined with high rates of evaporation prevent the water action playing a normal erosive part in the formation of the landscape, but some desert areas show records of heavy rain in a short period erratically distributed. These may be exceptional but they cause flood torrents which may cover a great part of the valley floor and some material is flushed out of the wadi causing badland degradation of the valley surface. On the other hand, valleys are formed or enlarged by temporary flood water torrents which carry small particles which can be easily transported, along with larger stones which can be more slowly flushed and which accumulate in the valley. This phenomenon is known to occur with an approximately 50-year frequency in the Helwan area south of Cairo (Fig (2.12)) yet the 15th of May New Town has been sited within the flood catchment of one of

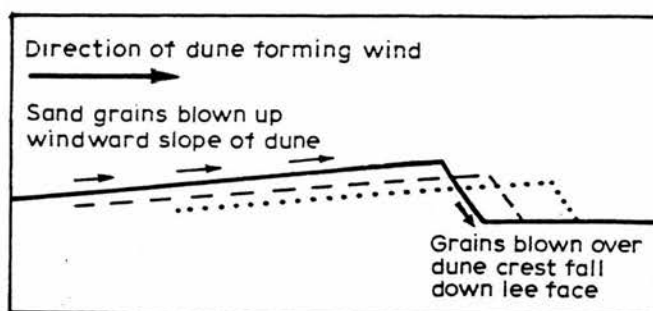


Fig (2.10) Forward movement of barchan (in cross-section) (Sawyer, op.cit., p98).

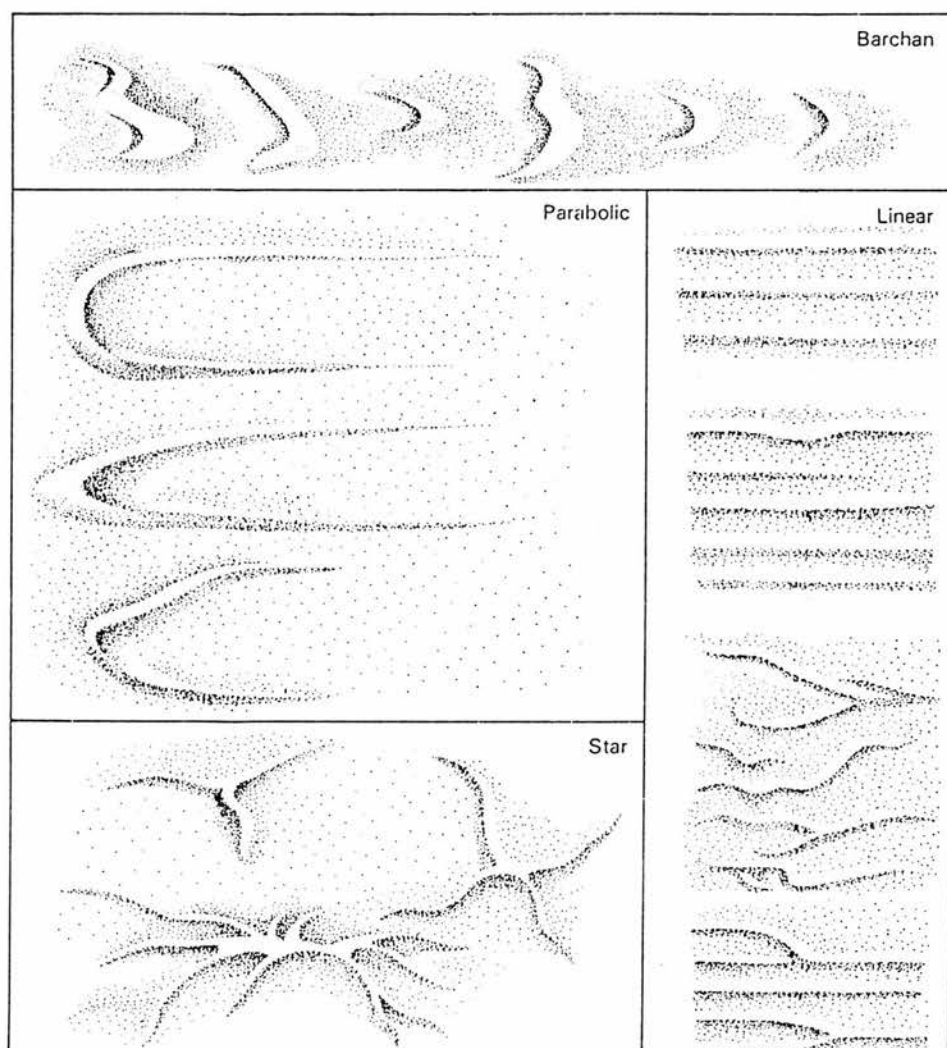


Fig (2.11) Some major typical dune patterns (Louw, G., et al., "Ecology of desert organisms", New York, 1982, p108.

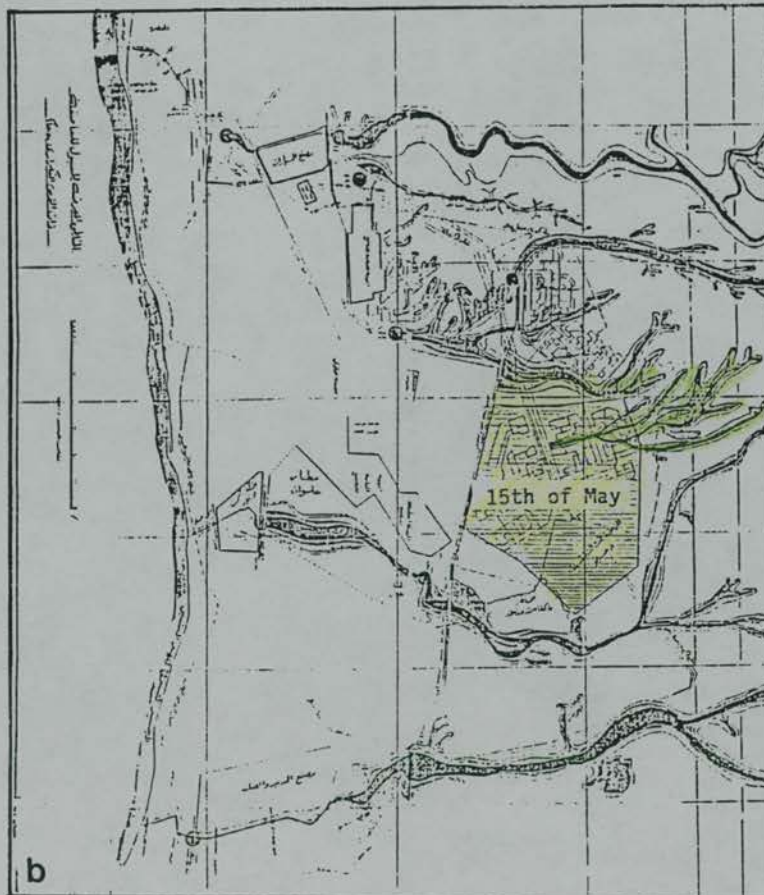
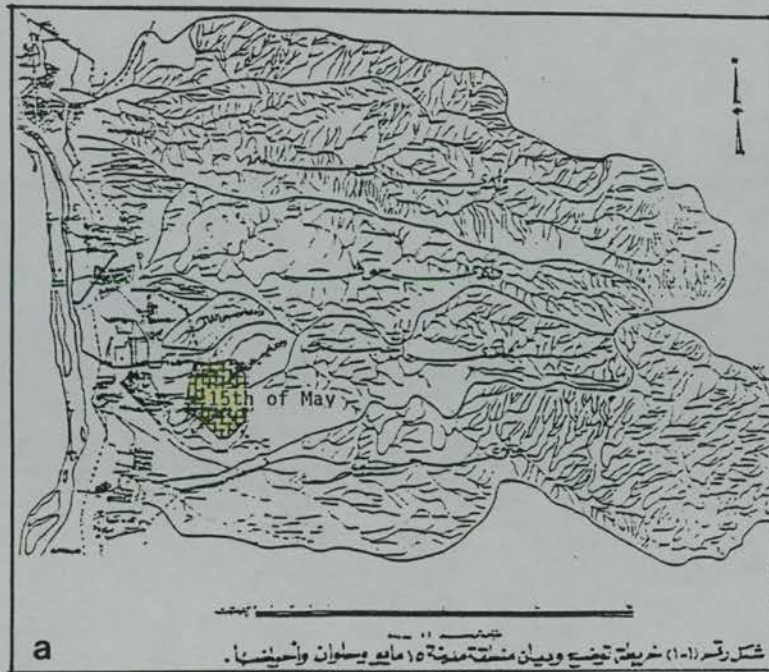


Fig (2.12) a) The form of wadis around 15th May New City.

b) Areas are exposed to flood torrent.

(Cairo Uni., 15th of May studies, Cairo, 1982, p3,61.

these wadis. Storm torrents are probably the major erosive agents in the desert at the present time.

### **Summary**

An understanding of the geological features of the Egyptian New Town sites will help to predict the way in which these sites have and are likely to behave over a period of time. In general, the main features of the geology of Egypt have been characterized through its recent history by arid climatic conditions except in fertile land in the valley.

The landscape characteristic of the Egyptian desert is comparatively more affected by recent erosional forces rather than the type and form of bedrock. The geomorphological feature of the Egyptian desert is primarily due to wind action. The wind is able to play a more significant part in moulding desert landscape. The effect of the wind degradation phenomenon (soil erosion) or the wind accumulation phenomenon (sand dune) should be considered in any new settlement in arid land. Also, precautions against storm water in some wadi areas may have to be provided. Desert runoff is strong enough to move bridges, destroy structures and transport huge quantities of silt, gravel and soil.

### **2.2 HYDROLOGY**

The availability of water to supplement the very low supplies of water and soil moisture is usually the most critical factor controlling development options in arid areas. Therefore, a fundamental starting point for a development project in arid areas must be to identify and evaluate the water resources available. It is no use completing a new town project design, then discovering that the water supplies are not adequate. This may seem obvious, but several recent projects for Middle Eastern countries have been completed on this basis and, not surprisingly, have failed [19].



### 2.2.1 The major sources of water in Egypt and their potential

#### **Surface water**

The Nile, 6700 km long, is the main source of water in Egypt (Fig (2.13)). Egyptians 5000 years ago as they settled to agriculture realized the importance of the Nile in their life, and perfected the art of irrigation. The Pharaohs were the first to control the Nile flood by elevating the river banks and constructing dams. Recently, the Aswan High Dam project was completed (1970) for long term storage of flood water which is 80% of the total Nile flow and was hitherto lost every year into the Mediterranean [20].

"Under the terms of the Nile Water Agreement which calculated the annual flow at 84 milliards (c.m. one milliard is a cubic kilometre of water) Egypt could take 55.5 and the Sudan could take 18.5. Regular rain in the Highlands feeding the Blue Nile, and an unnaturally high level in Lake Victoria, meant that by 1978 the dam was storing almost two years supply for Egypt. Since then, however, rainfall has dropped away and Lake Victoria has shrunk back to more normal levels. Since 1979 the floods have never been capable of replenishing the amount Egypt has been taking" [21]. In the summer of 1988 satisfactory flooding occurred as a result of rain in the Highlands and the Sudan and the stormwater level in Lake Nasser has returned to normal [22].

Within the next decade added water resources from the Nile project in Africa are expected to be around 9.0 milliard cu.m/year [23]. The main surface irrigation net exploiting this in Egypt is illustrated in Fig (2.14), with Lake Nasser as the main water store.

#### **Ground water**

Egypt has been familiar with the development of ground water resources since ancient times. Ground water occurs under various conditions: (1) Water table conditions in unconfined aquifers; (2) Artesian



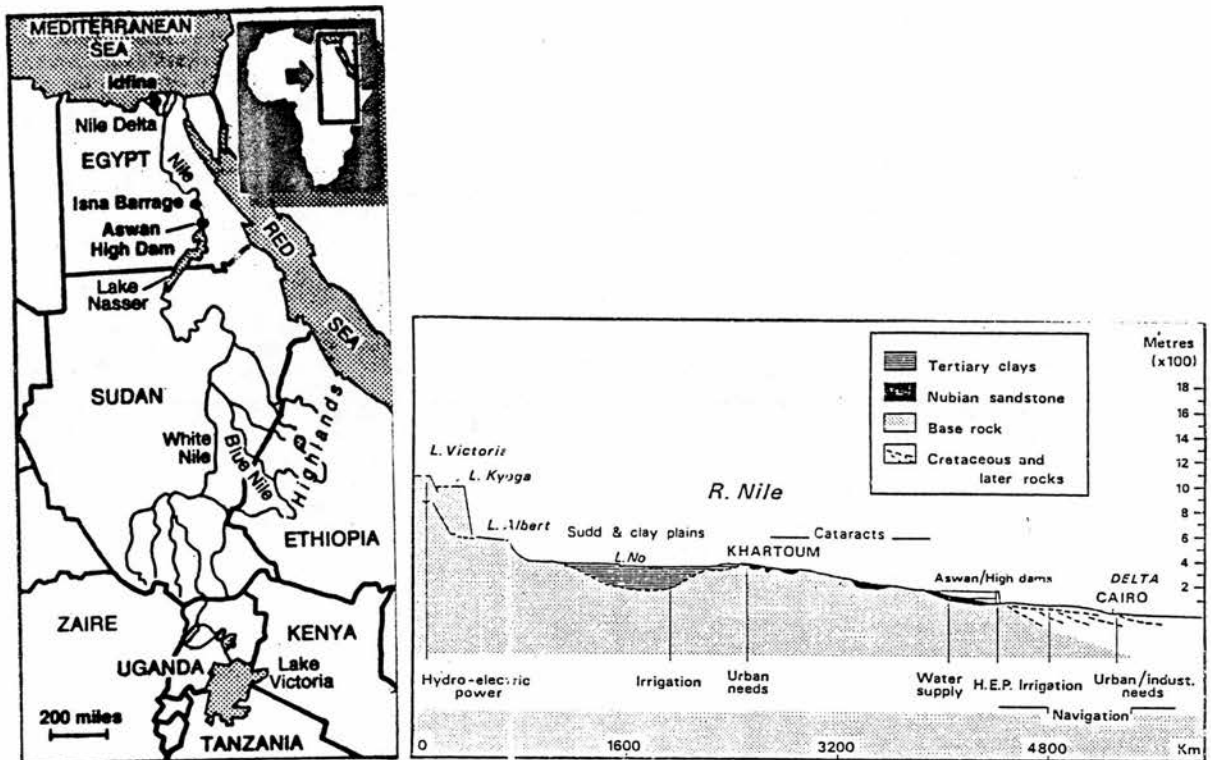


Fig (2.13) The River Nile and its main sources in the Highlands Plan & Section a-a (Plans: Murray, I., "The mighty source of civilization is drying up, Times, Nov. 5, 1987, p1; Section: Dix, G., "The Earth Sciences and planning in the Third World", Liverpool Uni., 1985, p31).

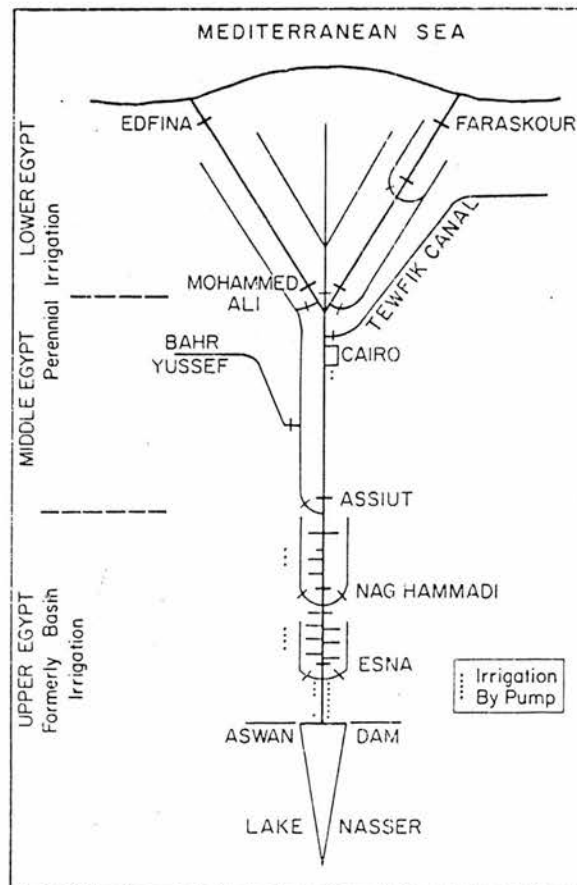


Fig (2.14) Diagram showing irrigation work on the Nile (Fisheer, W., "The Middle East", London, 1976, p490).

and semi-artesian conditions in confined aquifers; (3) Perched water tables.

In 1977, a five-year long U.N. exploratory hydrology study was completed in Egypt, from which it became obvious that water exploitation was possible and might be compared to a mining operation. The ground water available in desert areas which can be utilized in development is some 2.9 milliard cu.m/year in the Nile Valley, 2.5 milliard cu.m/year in desert areas and 2.5 milliard cu.m/year in western coastal area [24]. Underground water is the main source of irrigation in the New Nile Valley (Western Desert). Fig (2.15) shows that the ground water in Egypt is in part derived from high rainfall areas in Chad. Some current theories suggest that aquifers, to all intents and purposes, are not rechargeable, and are considered as new irreplaceable resources, like oil [24]. This point should be taken into account in the use of ground water plans.

### **Rainfall**

In extremely arid climates such as that of Upper Egypt, rainfall can be ignored as a source of moisture. In less arid situations, such as that of Lower Egypt, it can make a significant contribution to plant water requirements and should be included in any calculations.

The main area in Egypt which depends on rainfall is the northern coastal area. Here the average annual rainfall is 150 mm. This average decreases as we go south; at Wadi Natrun, it is 50 mm and at Aswan almost nil. Possibilities for minor agricultural development exist along the coast where a 200 mm rainfall brings sporadic, but successful cultivation [25].

### **Processed water**

Considerable interest is currently being shown in the reuse of water, particularly treated sewage effluent (TSE). The value of recyc-

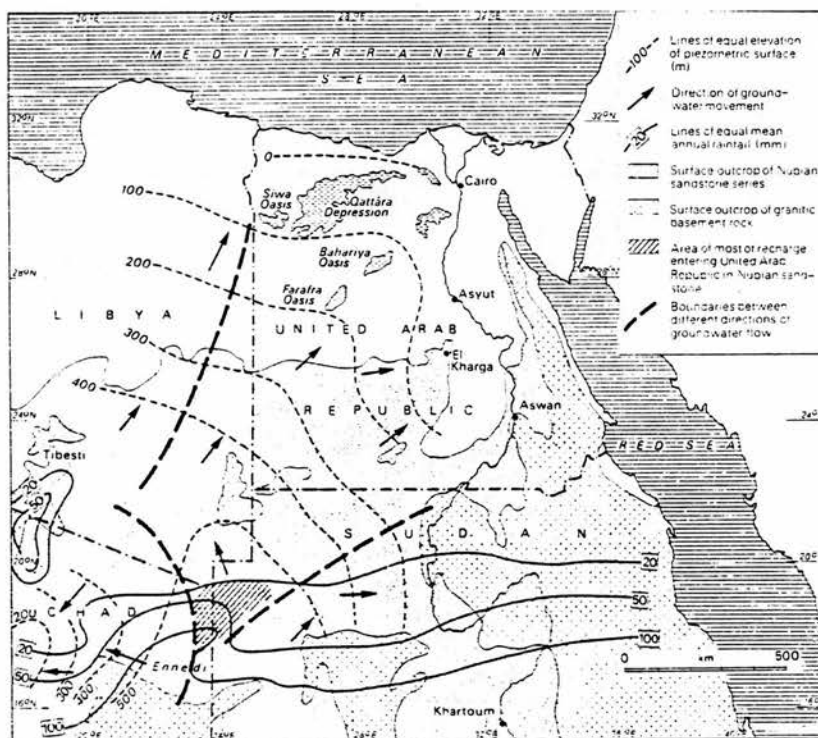


Fig (2.15) The main source for ground water in Egypt (Godie, A., op. cit., p61).

led water is totally dependent on its quality. There is a policy to adopt this idea in the new communities in desert areas.

Processed water can also be taken to include desalinated water, water from solar stills and water from dew precipitation. Obviously, this process will be especially important for development along the coastal area and it was adapted to provide water for residential usage on the north-west coast. Objections are usually raised against its widespread introduction on the basis of cost.

Drainage water can be used for irrigation and in areas where soils are highly permeable, and salt tolerant plants are grown. In areas where drainage water is of high salinity, it can be mixed with fresh water before its use. Irrigation with drainage water has been used in the Delta region; for instance, in 1976, 4.6 milliards cu.m were reused in irrigation [26].

#### 2.2.2 Water resources and new development

The question of water sufficiency has to be discussed here to see if water is secured for the required new town. The studies of expected water usage carried out by the Ministry of Irrigation indicate that the total available water resources in Egypt as a whole amount to some 68.2 milliard cu.m annually. This volume comes from:

- (55500) milliard cu.m, Egypt's agreed share of the Nile water.
- (12200) milliard cu.m, from the recycling of drainage water.
- (500) milliard cu.m, of groundwater in the Delta region [27].

With a currently estimated water requirement of 51410 milliard cu.m for the whole nation (the present irrigation (76%), domestic (10%) and industrial (14%) needs), the surplus water available at present for

agricultural and urban expansion is 16760 milliard cu.m. In addition, 9 milliard cu.m will be gained as Egypt's share from the Nile project in Africa (Sudd Project in West Sudan).

This implies that some (16200 + 9000) 25200 milliard cu.m, which is equivalent to about 50% of the present water needs, might be used for agricultural and urban expansion (including the New Towns plan) [28].

Based on studies made by the Ministries of Irrigation, Reclamation and Agriculture, 3.5 million feddans (feddan =  $4200 \text{ m}^2 = 4.2 \text{ acres}$ ) could be added to the cultivated land using available water resources for agriculture [29]. In long term projection water resources seem a critical factor for any development.

### 2.2.3 Criteria involved in analysis

With regard to the actual source of water, there are three basic criteria which must be evaluated - quantity, quality and cost.

From the previous evaluation section (2.1.2), it was found that there is sufficient water quantity available for the new developments (agricultural, industrial and urban). This evaluation should be considered in relation to the proposed scheme of these developments, not only with regard to the short-term availability but also long-term safe yield.

Given present water usage practices, water supplies in Egypt are adequate to meet the current demands, but it should be noted that further development will require extensive water supplies. There has been a lack of attention in Egypt to conservation practices with consequent wasteful use. Insofar as agricultural use may account for a high percentage of water requirements in the region (76%), the greatest saving may be achieved in irrigation projects. Within the urban area conservation practices will also produce a saving. Nowadays the conservation of the Nile water becomes an urgent task, especially after

the shortage of the incoming floodwater since 1979.

The second is that most of the water resources of Egypt are of good quality, for agricultural purposes, including the agricultural drainage water which could be reused for irrigation.

Salinity is considered one of the main problems in the new reclaimed areas in the desert. This depends on the soil, the salinity level in the irrigation water itself and the irrigation management required. Therefore, a careful study is needed to identify the quality of water. Once the quality of irrigation water is known, plant species, irrigation systems and irrigation management regimes can be selected which will ensure successful plant growth.

Finally, establishing the cost of obtaining water for a planting project will involve comparison of alternative sources and their development costs. Whatever uncertainties exist, there is no doubt that to develop the Nile and/or alternative new water supply sources would be expensive [30]. There is, therefore, a need for comprehensive studies on water supply covering the whole new towns project. These studies should precede the implementation of proposals.

#### **2.2.4 Irrigation**

In rainy areas, irrigation is usually a minor part of a landscape project. In arid areas, however, irrigation determines the whole success of the scheme and this must be reflected in the attention given to it.

There are five principal types of irrigation. None of these methods is completely satisfactory for a hot, arid climate, and all have some drawbacks (Table (2.1)). These types are as follows:

##### **Nabatean method of irrigation (rain irrigation)**

This technique of farming was known by the Nabateans in the second century B.C., with 50 to 100 mm of rainfall per year in the Negave Desert and Sinai [31].



Now this technique is known as run-off farming. Each farm was a small, self-contained unit consisting of a large water catchment area and a much smaller cultivated area; channels were cut out to lead water from the catchment area down the fields (Fig (2.16)).

This technique is found in Egypt in the coastal areas where the rainfall is 150 mm. There is a network of wadis (218 wadis for the western coastal zone) which collect run-off from their catchment and concentrate it on the alluvial areas at the end of the wadis. A recent study of this area indicates an estimated rainfall and run-off sufficient for 135000 feddans yearly [32].

### **Surface irrigation**

The traditional method employed in Egypt is flood irrigation using a channel or a hose whereby water is flooded into a flat basin or parcels of ground at periodic intervals and then left to soak into the soil (Fig (2.17)).

Surface irrigation methods result in low to medium water use efficiency. It accelerates salinization and water logging in areas where leaching and drainage systems are not properly designed, as in some reclaimed areas of the west Delta. From the Egyptian experience in desert reclamation, the flooding system is not recommended for sandy and light textured soils in newly reclaimed areas as most of the water is lost too quickly back into the atmosphere. The flooding technique can lead to a heavy build-up of salts near to the soil surface when ponding of water carrying dissolved salt from desert soil occurs and later evaporates.

### **Sprinkler system**

The characteristic of this type of system, which includes fixed and moveable sprinklers and center pivot types, is that water is piped to distribution points from which it is sprayed on the plant or the soil

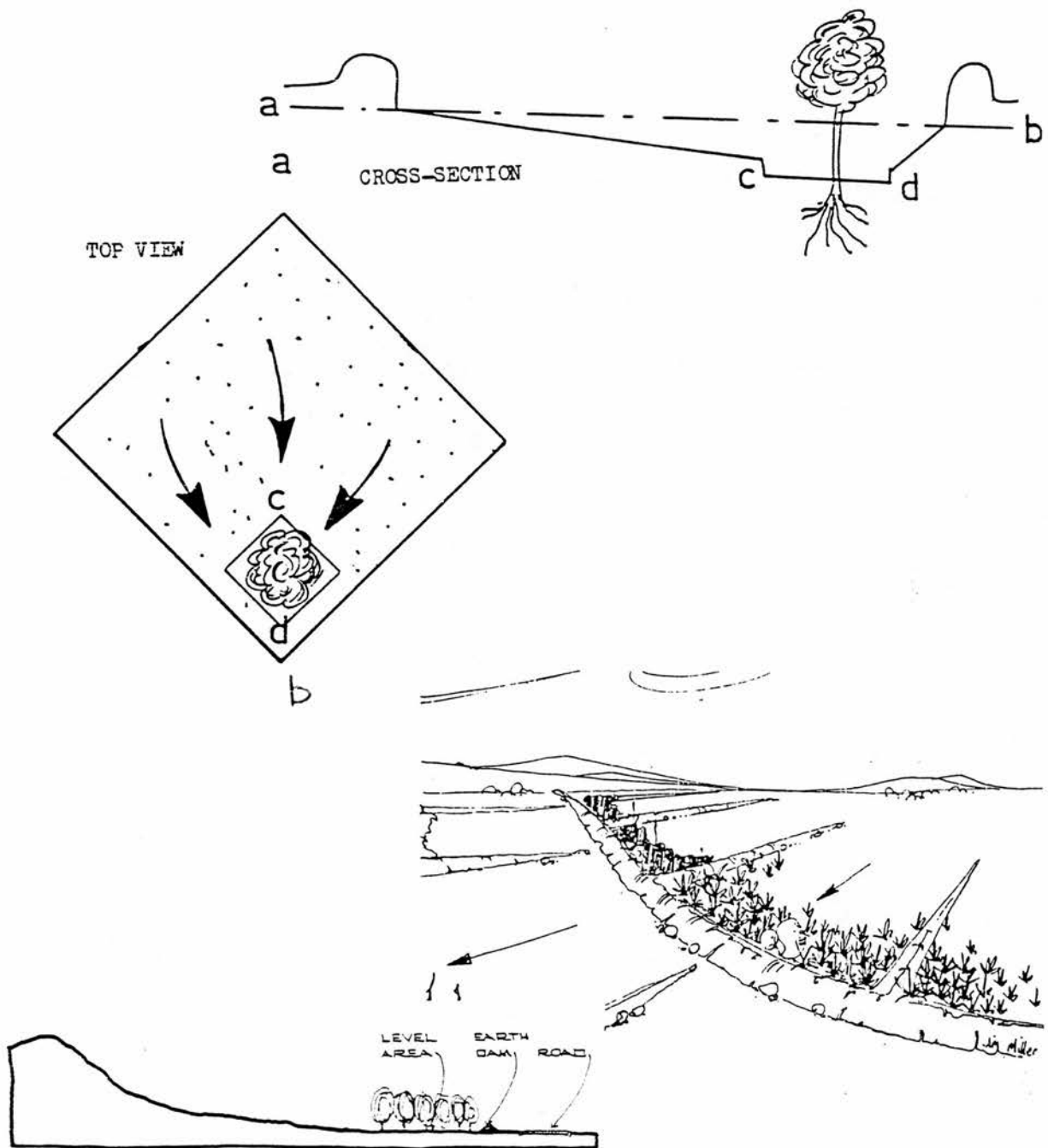


Fig (2.16) The Nabatean method of irrigation.

- a) Sketch of plan and cross-sectional views of a micro-catchment.
- b) A strip farm where runoff is caught in small berms and the water thereby concentrated for plant growth.
- c) A small earth dam built to retain runoff.

(a,b - FAO, "Conservation in arid and semi-arid zones", Rome, 1976, p67-68; c - Turner, T., "The design of open space", Cochrane op.cit., p32).

below the plant (Fig (2.18)).

This type of irrigation may be moderately efficient in conserving water and is well adapted to the reclaimed lands of high permeability such as the Salhia Project (western Delta). It produces good results after a few years of use but still tends to waste water.

#### **Trickle system**

The trickle system pipes water to individual plants or groups of plants and is applied accurately to a point on the soil surface at a pre-set rate (Fig (2.19)). This technique is still not popular in Egypt, except in some research areas of land reclamation, but it offers the greatest scope, using present technology, in water conservation and the most efficient use of available water.

#### **Sub-surface system**

Irrigation pipes are located under the soil with outlets located at fixed intervals near the roots of the plants (Fig (2.20)). This technique may also greatly reduce evaporated water losses but still has technical disadvantages and is also not widely practical. However, drip irrigation either above or below the surface is now the favoured method for the majority of landscape projects in an arid climate.

In conclusion, the purpose of irrigation is to create and maintain the optimum moisture regime for plant growth. For this, a comparison between four out of the five systems of irrigation which could generally be used in Egypt is illustrated in Table (2.1) to see the location of each system according to the different criteria.

From the previous table (2.1), there is no ideal form of irrigation for any installation. The method of irrigation used on any installation will be decided by investigation of the particular plant requirements, soil types, water quality and quantity and the basic architectural concept of the installation.

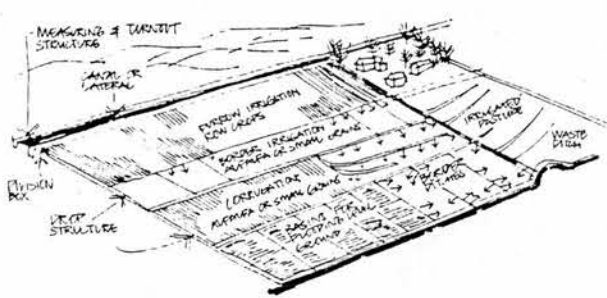
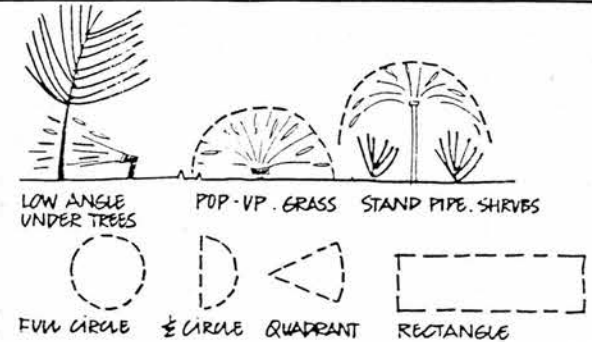
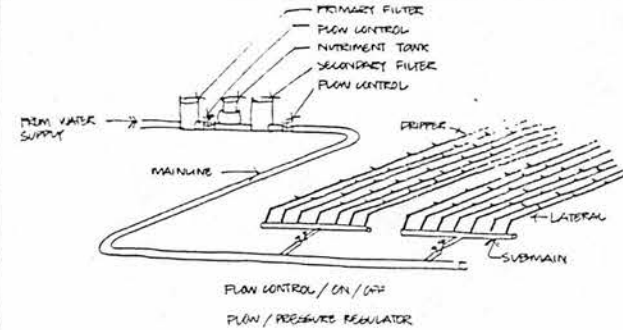
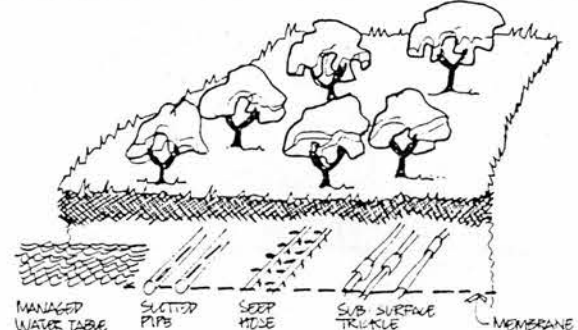
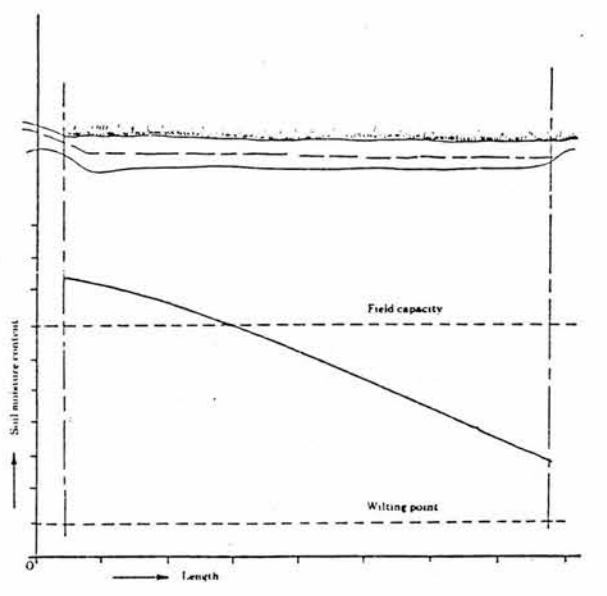
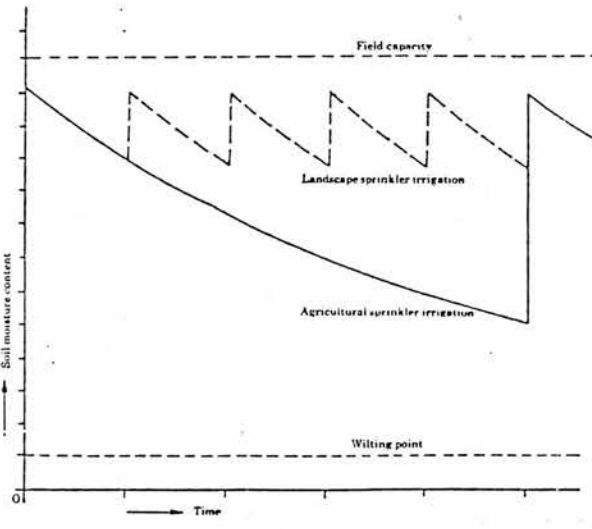
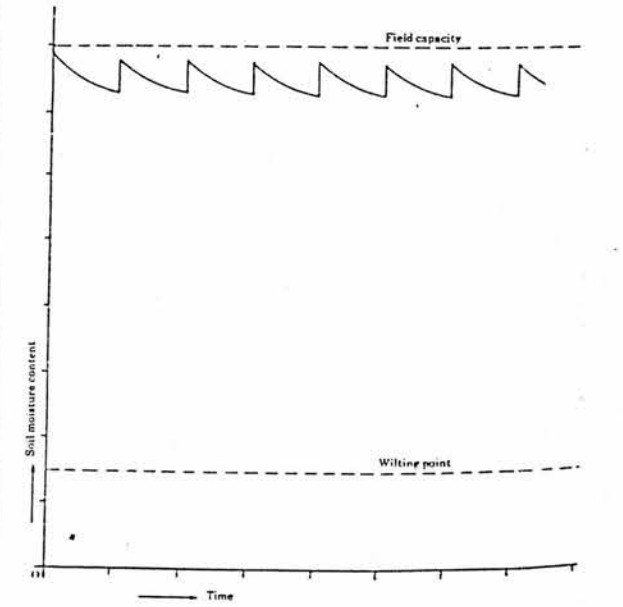
|                       | 1. SURFACE IRRIGATION  | 2. SPRINKLER   | 3. TRICKLE   | 4. SUB-SURFACE   |
|-----------------------|--|--|--|--|
|                       |  <p>Fig (2.17) Surface irrigation (Willens, Cochrane op.cit., p54).</p>             |  <p>Fig (2.18) Sprinkler irrigation (Ibid, p54).</p>   |  <p>Fig (2.19) Trickle irrigation (Ibid, p55).</p>  |  <p>Fig (2.20) Sub surface (Ibid, p56).</p> |
| Soil moisture content |  <p>Impractical to maintain low soil moisture tensions</p>                         |  <p>The ability of sprinkler systems to lower soil moisture tension varies with configuration and with the standard of engineering involved</p> |  <p>It can maintain very low moisture tensions</p> | <p>Same as (3)</p> <p>It can maintain very low soil moisture</p>   |
| Control               | It depends normally on practice using such systems to irrigate to field capacity and then wait until the permissible soil moisture builds up before irrigating again | The systems are easy to control and can be fully automated   | It is possible to maintain almost any require moisture regime  | It is comparable to the above-ground trickle system in the degree of control which can be achieved                             |
| Salinity              | Leads to a high rate of salt accumulation  | It sometimes causes some build-up of salinity  | Very low salt-building capacity. This makes for easier management of soil salinity levels  | Same as (3)  |
| Efficiency            | It has the lowest water use efficiency   | They are more efficient than the surface systems (using 75% of the water surface). They are more efficient when run during the night   | They are extremely efficient in terms of water use. (Uses 60% of water sprinkler) (Uses 40% of water surfaces)                         | It is extremely efficient in terms of water use  |

Table (2.1) A comparison between the four systems of irrigation (prepared by the author, main source from Ali, Bishay op.cit.).

|  | 1. SURFACE IRRIGATION   | 2. SPRINKLER   | 3. TRICKLE   | 4. SUB-SURFACE   |
|--|---|--|--|--|
| Limitations on use                         | Topography is the principal limitation because the soil surface is used for water transport systems. The systems are also limited in that their ability to handle saline water is low   | They are less affected by topography than the surface system, although it is still a factor to consider. Centre pivot types in particular require flat land<br>They cannot handle saline water. In high temperatures they produce scorch; efficiency is also reduced by strong winds                           | Requires high standards of filtration to avoid blockages. Algae can be a problem. It is the most suitable system for use with (T.S.E.) or saline water   | Sophisticated watering systems are always prone to breakdown, especially in a developing country like Egypt. Blockages are still a major problem, and managed water table. |
| Visual qualities and design considerations | The various canals and channels required for surface irrigation are normally introduced into the landscape. This requires a careful selection of land gradients which can pose an immediate problem for the architect<br>However, by incorporating them into the design exercise, they can be used to form patterns of hard landscape | Sprinklers often have to be operated at night in landscape schemes to reduce evaporation loss and avoid spraying passersby. They are not generally regarded as obtrusive and contribute significantly to the visual effectiveness of schemes, especially if operated in the evening along with flood lighting. | Trickle systems sometimes are visually unobtrusive but get in the way in pedestrian areas unless buried. In such cases, it may be preferable to use solid p.v.c. laterals with similar risers. It places few constraints on the architecture | Visually, they are not visible. They can be made to fit almost any shape and are not affected. Irrigation lines need to be accurately marked for maintenance.              |
| Maintenance                                | Requires a high input of manually skilled labour to operate and maintain the system. This has <u>traditionally</u> been available in Egypt.   | Will require the services of technical men as a result of the automated installation   | Same as 2  | Same as 2  |
| Cost                                       | The costs incurred in flood irrigation are mostly local, and depend on land construction (moderate)   | It is incurred by materials. Supervision and maintenance labour costs are also expensive and alien to Egyptian practices   | Same as (2)  | Same as (2)  |



### 2.2.5 Drainage

Drainage in arid areas may be defined as the removal of excess water and leaching of inhibiting salts from agricultural lands [33]. It is one of the most critical aspects on which the maintenance of irrigated agricultural production depends.

All properly irrigated land in the world requires drainage. It may be natural, artificial or a combination of both. A successful drainage system may be simple or complex, depending upon site conditions. In general, drainage can be divided into two basic types; surface drainage, being the removal of excess surface water from irrigation and precipitation, and subsurface drainage, as already implied, referring to the control of ground water height and salts through the removal of excess subsurface water.

Drainage in Egypt is considered one of the main problems in the Nile Valley and in new reclaimed desert land. The water table has risen in many areas, highlighting the fact that far too little attention has been paid to installing proper drainage [34].

A policy to control the use of irrigation water has to be adopted to save water resources. It has been estimated that one-sixth of Egypt's share of the Nile water could be saved annually if drainage water were to be recycled instead of being allowed to flow into the Mediterranean [35].

### 2.2.6 Water management

In Egypt, especially in desert areas, the annual soil moisture deficit can be very high. It is therefore important that annual water requirements be established with some accuracy to determine, in turn, the viability of a landscape development in an area where water is scarce. Water demand is always high during the two to five years establishment period. This can vary according to species and local



conditions, but after that period the demand drops significantly. Thus, if a planting programme is phased carefully, total water demand for establishing landscape planting can be kept relatively low.

The fundamental questions a landscape architect needs to answer are:

- How much water is to be applied?
- When and at what rate?
- What method of irrigation is preferable?
- What quality of water is desirable for the particular soil type and the nature of the plant material?
- To cope with contingencies, what are the alternative sources of water likely to be available and what is its quality?

Water management is the application of the correct amount of water to the soil to meet plant water requirements, evaporation from soil and any additional water needed for salinity control without excess runoff or deep percolation.

Irrigation water should be treated as a limited and scarce resource. The management of irrigation systems in Egypt needs to be improved to avoid wastage, particularly at field level.

It is vital that the monitoring of water quality (including possible health hazards, soil quality, salinity levels and water table level, etc) should be a regular part of the management programme.

#### 2.2.7 Ecological impact

Water is the most important limiting factor for the distribution and productivity of desert ecosystems. Water is transported as heat is transferred. This means that the desert plants and animals which are frequently exposed to high ambient temperatures and insolation are also exposed to air with low water vapour pressure and this marked water

deficit will have a profound desiccating effect, in the absence of specialised adaptive responses which evolve to overcome this problem.

In contrast, many deserts (Northern Egypt) have an increase in humidity at night, which would be useful for providing good conditions for plants and animals for several hours.

In arid areas, water, more than any other factor, is the principal limiting factor governing the kinds of plants and animals and their distribution. Hence productivity is dependent upon rainfall. Productivity in turn characterises the community. The effect of rainfall on production was recently measured in the Namibian Desert (Fig (2.21)). The Figure shows that the standing biomass of plants and animals was determined in the dune ecosystem during a period of average rainfall (14 mm) and after an exceptional rainfall event (118 mm). The potential energy in plant, detritus and animal biomass increased nine-, seven- and six-fold respectively. This indicates the central role of water in desert ecosystems.

Another factor which must be considered in extremely arid areas where rainfall is less than 100 mm is the unequal distribution of water in the soil, which is reflected in the plant cover. The absence of close plant cover results in very pronounced surface run-off. Therefore, on higher ground less penetration occurs in relation to the rainfall, while much more penetration occurs in hollows.

The distribution of vegetation is correlated with this water distribution and thus is concentrated wherever the soil water storage is greatest, the water supply here being commonly no less than in wetter areas, i.e. natural surface irrigation.

Fig (2.22) shows a schematic representation of the change from randomly distributed vegetation (1 and 2) to that which is contiguously distributed (3 and 4) with decreasing rainfall in extreme arid areas.

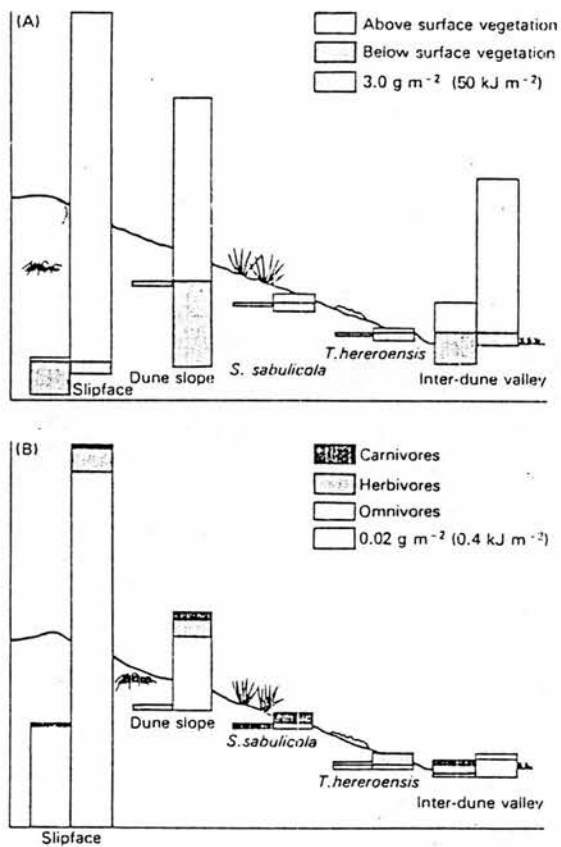


Fig (2.21) The change of standing biomass of "A" plants and "B" animals from a dry period (left-hand side of each column) to a wet period (right-hand side of each column) was measured in the Nanib dune system (Louw, op.cit., p115).

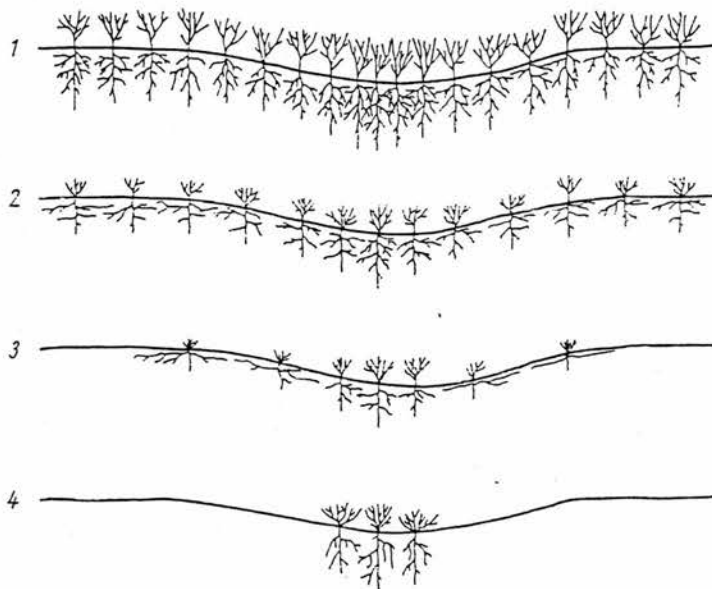


Fig (2.22) Schematic representation of the change from a randomly distributed vegetation (1 and 2) to a contagiously distributed one (3 and 4) with decreasing rainfall in extreme arid areas (Walter, H., "Ecology of Tropical and Subtropical vegetation", Shattant, 1971, p274).

By this we imply that the largest part of an arid area is completely barren of plants and that vegetation becomes more or less restricted to the valleys.

In the Northern Desert of Egypt, olives can be cultivated with an annual rainfall of 100 mm in this region, if the run-off from stony ridges is led into the olive orchard. The catchment area must be at least four times that of the cultivated area [36] cf Nabatean irrigation.

In spite of the rainfall in desert areas always occurring in sudden and heavy bursts of short duration, the ground soil is unable to absorb the moisture at the rate it receives it because of run-off and high rates of evapotranspiration. Therefore the water used directly by plants is only a small proportion of the precipitation.

Not only are the amount and the distribution of rainfall important factors, but the distribution of precipitation throughout the year also plays a part. As a result of the rainfall only occurring in winter, native plants lie dormant during summer and become active during winter.

### **Summary**

In arid areas, water, more than any other factor, has a predominating influence on desert organisms. Not only does the amount of water control the plant cover, but the unequal distribution and seasonality of rainfall also have a great part in this.

There is no doubt that the spreading of activities to new settlements on desert land demands huge quantities of water. As shown in the previous discussion (2.2.2), there is or will be a theoretical surplus of water of about (25000) milliard cubic meter available for urban and agricultural expansion which will be mostly in desert areas. This huge surplus could however be reduced to nil if there is no management policy. The fundamental starting point for a development project in

arid areas must be the identification and evaluation of the water resources available.

Economy in water usage within the agricultural sector is critical if the nationally available water resources are to meet the future needs. Traditional methods of surface irrigation in Egypt need to be replaced gradually by methods that are less profligate in their use of water. The New Town areas provide an ideal opportunity for the gradual introduction and assessment of new irrigation techniques which should then permit the application of the successful techniques in other areas of Egypt which have long-established irrigation procedures.

In arid areas irrigation determines the whole success of a landscape scheme, and irrigation water should be treated as a limited and scarce resource. The choice of irrigation system depends on the water quality and quantity, site topography, soil and climate. There is no single satisfactory method for a hot, arid climate; all have some advantages and some drawbacks.

At the same time drainage is one of the most critical aspects on which the maintenance of irrigated agricultural production depends upon and it can also act as a source of irrigation by reuse of the drainage water.

## 2.3 SOIL

Desert soils are characterized by their lack of breakdown of mineral structure from parent rock, poorly developed soil horizons and a very low humus content [37].

### 2.3.1 Soil map of Egypt

A recent soil survey of Egypt has been carried out for the world soil map project (Fig (2.23)). This shows that a large proportion of the country, about 17%, is covered by litho soils, especially in the Eastern Desert, Southern Sinai and on the El Gilf El Kebir in the south-

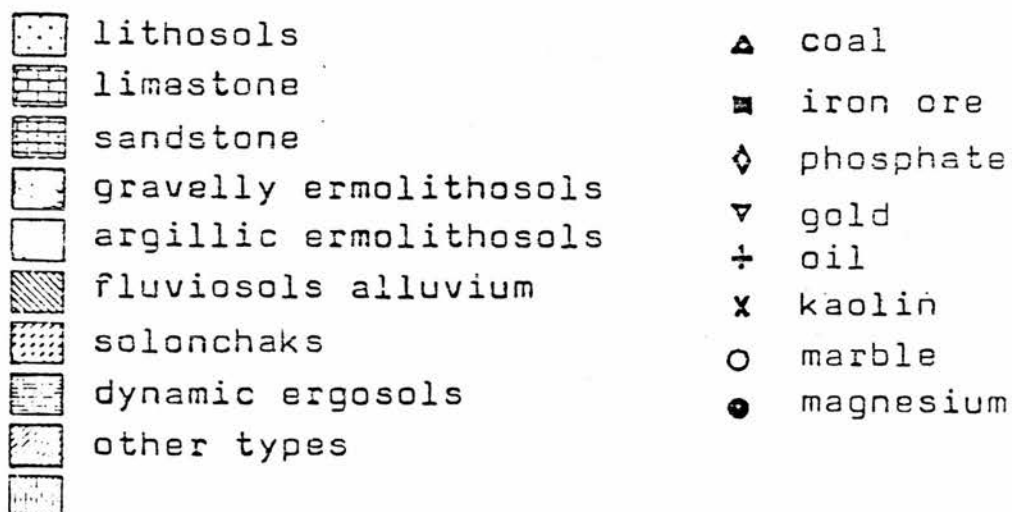
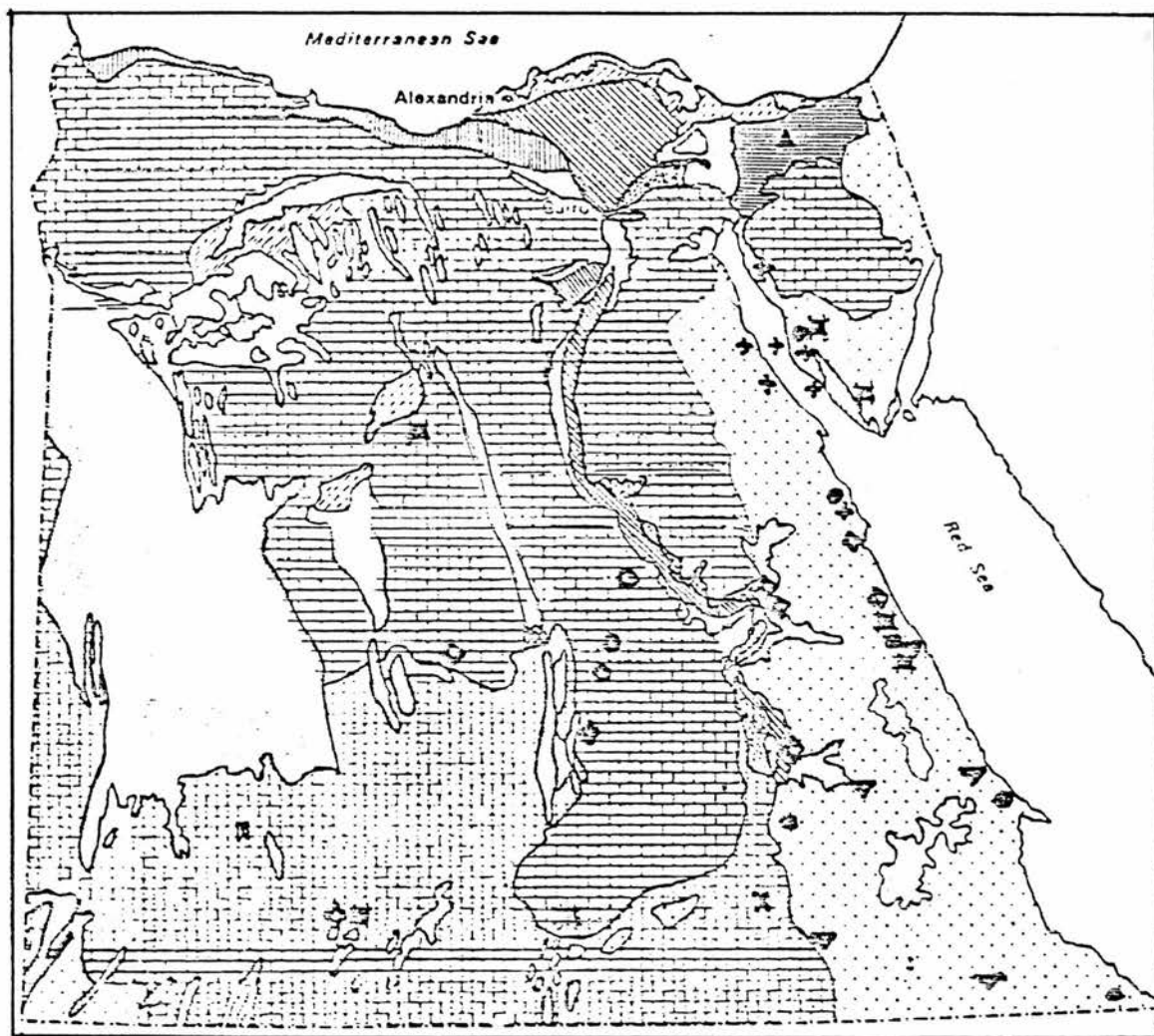


Fig (2.23) Mineral resources and soil map of Egypt (Abdin, A., "A Bio-Climatic Approach to House Design for semi-desert and hot climates with special reference to Egypt", Ph.D., Liverpool Uni., 1982, p199).



western part of the Western Desert. This material is usually basement complex consisting of Pre-cambrian igneous and metamorphic rocks with some more recent volcanic rocks. Soil profiles are shallow and stoney, possessing only a weakly developed horizon. Rock out-crops are common and slopes nearly always steep.

Limestone soils, which account for 25% of all the country's soil, predominate in the central and northern parts of the Western Desert. Thin crusts of physical weathering which have been smoothed and polished by aeolian activity are developed on limestone plateaux. Some fine material occurs beneath the weathered stones, making the surface very level.

Sandstone lithic ermolithosols are developed on the Nubian sandstone and cover some 20% of the country, mainly in the southern part of the Western Desert. These soils produce a very bare and smooth form of desert pavement which has been intensively affected by wind action. Again, no profile development is seen.

Shifting sand dunes (dynamic ergoals) covers 16% of the country in a series of scattered zones throughout the main plateau region. The best-known occurrence of these soils is undoubtedly the great sand sea of the Western Desert.

All other soil types cover only very small areas of the country. Most of the cultivated areas are restricted to these groups, namely fluviolsals (alluvium), which cover less than 4% of Egypt and are developed on Nile silt, as a consequence of which they are heavily textured [38].

In general, the absence of a true soil cover is a prominent characteristic of the hot desert of Egypt.

#### 2.3.2 The relationship between arid soil and vegetation

The different types of soil in the desert is linked both to the

present geological structure of the land (Fig (2.24)) and to the climatic patterns. At the same time, the establishment of vegetation and its community type depends on the depth of soil and its physical character.

The stone desert or "Hamada";

All fine weathering products are removed by the wind from the top of the plateaux. In this process, stone fragments about the size of a hand accumulate on the surface to form a stone pavement. Beneath the stone pavement is a brownish-red dust soil of irregular depth. Relatively speaking, this type occupies the largest areas of the Egyptian desert.

As a result of low water reserves in the soil and usually rather high salt content in the hamada soil, it appears to be completely barren of vegetation, except in some rock crevices and cracks in regions with a light rainy season, allowing some species to grow (Fig (2.25)).

The pebble or gravel deserts "reg";

The cementing materials are removed by the wind and pebbles accumulate at the surface. Gypsum accumulates as a fine powdery mass beneath the superficial layer of gravel as in the gravel desert between Cairo and Suez [39].

The surface gravel is commonly so compact that roots can hardly penetrate it. Thus, the gravel desert is without vegetation, except in some sand-filled depressions.

The sand desert "erg";

The sand accumulates in depressions forming the sand soil. These sand deposits are usually only shallow, but reg relates to extensive dune areas which form vast seas of sand.

Plants can become established if their roots extend into the damp layer. Shifting dunes, whose sand is constantly moving and therefore

Block diagram to show the relationship of desert soils to the landscape

1. Reg or stony desert
2. Clay pan (saline)
3. Alluvial tract
4. Red or grey desert soils
5. Erg or dune sand
6. Plateau formed by duricrust

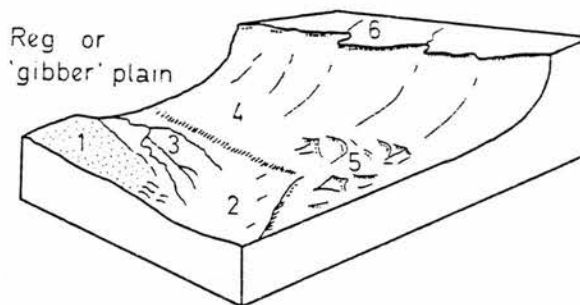


Fig (2.24) Block diagram to show the relationship of desert soil to the landscape (Bridges, E., "World Soil", Cambridge, 1970, p78).



Fig (2.25) Wadi Hoff near Helwan, Cairo, Egypt. Hamada or stone desert with steep slope (Walter, op.cit., p439).



Fig (2.26) Wadis area in the desert between Cairo and Suez, Egypt with Haloxylon salicornicum (Ibid, p442).

exposed to desiccation, are barren of vegetation.

The dry valley "wadis";

Erosion channels are present in the stone and gravel desert. They are cut out of these plains and join to form larger water courses and valleys. These areas are known as wadis. The surface of wadis is considered the most favourable for plant growth (Fig (2.26)).

### 2.3.3 Soil reclamation

The total reclaimed area from 1954 to 1978 is about 912000 feddans; 759300 feddans being from around the Delta valley and the remaining 152700 feddans from the desert.

Based on studies made by the Ministries of Irrigation, Reclamation and Agriculture, 3.5 million feddans could be added to cultivated land [40]. During the last two decades, various desert areas of Egypt were have been considered for agricultural development, either by the use of available ground water or by the use of Nile water. These areas are shown in Fig (2.27).

From the Egyptian experience, care should be exercised in preparing a programme for land reclamation in Egypt because of certain difficulties which have been highlighted in this field. For example, the available soil is of marginal quality for agriculture. Construction costs for irrigation and drainage facilities will be high, in addition to the cost of land reclamation. It is estimated that the average cost will be 1000 L.E. per feddan at 1975 prices [41]. Also, recent reclamation projects in the area outside the Nile Delta have had some difficulties such as salinity, water logging, sand dune encroachment and land degradation by wind [42]. Therefore, the availability of water and the need to reserve available water for the best land should be considered.

#### 2.3.4 Soil salinity

Saline soils in Egypt are, as one might expect, very pronounced in regions with marine sedimentary rocks (Jurassic, Greta-ceausterting), [43]. Here one can often observe directly the salt blooms from specific strata of the weathered rock. Thus, in arid areas, easily soluble salts migrate from higher to lower sites during rain, that is when precipitation exceeds evaporation. This means that salinisation development is somewhat connected with rainfall.

Saline soil could not develop naturally under very dry conditions like the Egyptian desert, where rainfall is not sufficient to dissolve and transport the salts, but soil salinity could be developed by ground water. However, salinisation can also occur by other means such as salt which evaporates from sea water, salt dust and coastal fog which contains salt. The common feature of developing salinity in Egypt is the technique of irrigation applied and poorly drained.

Saline soils are formed and developed in places where the amount of soluble salts accumulating is greater than the amount removed. The main cause of salt accumulation in soils and solonchak formation is the preponderance of evaporation over drainage. Hence all conditions and factors which increase the evaporation of ground water coupled with lack of drainage will facilitate this process. Water balance in the form of the ratio of evaporation to precipitation drainage depends on climatic, geomorphological, topographical, hydrogeological and biological (vegetation) conditions. Moreover, a vital part is played by the economic activities of man.

The main factors that affect salinity may be as follows [44]: firstly, the influence of climate; saline soils occur most often in regions with a pronounced dry climate where the evaporation of surface, and in particular of ground water exceeds the run-off, either all the

year round or, at any rate, during certain seasons. The drier the climate, the greater the importance of evaporation in the water balance of the region and the smaller the importance of run-off and drainage.

Secondly, the influence of geomorphological and topographical conditions: the climatic factor is not enough in itself to set up salt accumulation and cause the formation of saline soils. In each climatic zone, salt accumulation is possible under specific geomorphological and relief conditions as mentioned above.

Thirdly, the significance of hydrogeological conditions: contemporary salinisation occurs only when the aforesaid climatic and topographical features combine with a high ground water table, and where the ground water is stagnant and has little natural drainage; when the ground water lies close to the surface, but has good drainage, salinisation cannot take place as all soluble salts are leached downwards.

Fourthly, the role of plant cover: plant cover plays a very important part in the salt regime of soils and the formation of solonchaks; its effects are both complicated and contradictory. A thick cover of herbaceous plants reduces the evaporation of ground water from the soil surface because the roots absorb water through transpiration. This reduces the salinisation of the top soil horizon.

After dying, the root system of the plants enriches the soil as humus, which improves the soil structure and increases its non-capillary porosity. This in turn lessens the capillary conductivity and so decreases both the surface evaporation and the salinisation of the top soil horizon.

Destruction of the plant cover changes this regime. The surface evaporation increases and salochat soils are quickly formed. Cultivated plants in irrigated agriculture and, more particularly, perennial grasses used with correct crop rotation have the same qualities as



natural vegetation with respect to improving the structure and salt-water balance of the soil. The case is especially marked with alfalfa. However, salt accumulation underneath the plant cover not only does not stop, but may even be intensified.

Another point to be taken into consideration is the way in which vegetation affects the migration of salts by absorbing them and freeing them again when dying.

The main factors which affect salinity have been mentioned above, but the most critical points which may lead to the development of salinity are those which result from man's activities and usually through the application of water in irrigation. For this, there are some points which should be identified to avoid salinity problems. Adequate water must be supplied for the plants to survive in extremely hot conditions. Therefore, temperature patterns must be known and evaporation measurements taken. The volume of water needed and the area covered by the plants should be identified.

It is then necessary to examine the soil conditions in detail, such as measurement of soil ability to absorb water and to allow it to drain, and the chemical constituents of the soil. In particular, the elements which must be known are the ratio of sodium to calcium and magnesium. Sodium always easily replaces calcium and magnesium and leads to the soil becoming impermeable, which in turn stems the vertical drainage and leads to water logging. The water to be used for irrigation purposes also must be similarly examined.

Salinity management is required on all irrigated lands, but is especially important with desert soils. There are numerous examples of reclaimed land in desert areas which have failed owing to the lack of salinity management. The Naubarin Project is one of them. The yield of crops in this new reclaimed area was startling, but within a period of

five years deterioration was observed. After a study of this phenomenon, it was concluded that salinisation was one of the main causes [45].

Salinity problems could appear as a side-effect of land reclamation projects. In the short term, it is often the case that the direct benefits of a project outweigh the disadvantages from environmental side-effects. However, in the longer terms the side-effects can become more important than the direct benefits [46]. There are examples of this from all over the world, for example the salinisation of new agricultural land in western U.S.A., where the salinity became very serious after 20 years of land reclamation. Therefore, salinity management should be considered as a critical problem in any new development in desert areas.

#### 2.3.5 Ecological impact

Substrate is a factor with marked effect on plant communities found in deserts. The amount of water which penetrates the soil not only depends on the amount of rainfall, but also on the amount of run-off or seepage. Only part of the total amount is available for plant growth. A schematic illustration is provided to explain these rather complex relationships (Fig (2.28)). The proportion of surface absorption and run-off are dependent on the slope and also on soil texture.

In general, run-off is greatest on clay soil, least on sandy soils and non-existent on loose and stony shingle. However, run-off is dependent upon soil texture and the proportion of water which penetrates the soil.

Here it must be emphasised particularly that in arid regions soil texture has the opposite effect on water-plant relationships to that in wet areas [47]. In wet areas, clay holds water and sandy, rocky soils are considered the driest. The opposite occurs in arid areas. Soils in arid regions are never completely wetted; great quantities of storage water are found only in the upper layers (substrate) as deep as the

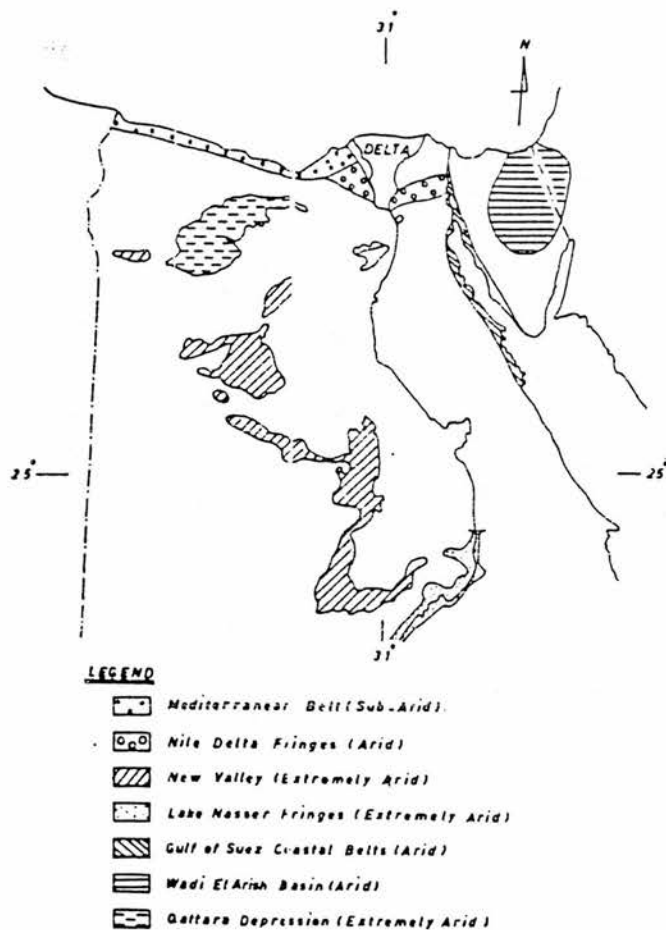


Fig (2.27) Areas were considered for agricultural development (Shata, A., "Application of Geoscientific Knowledge", Bishay op. cit., p191).

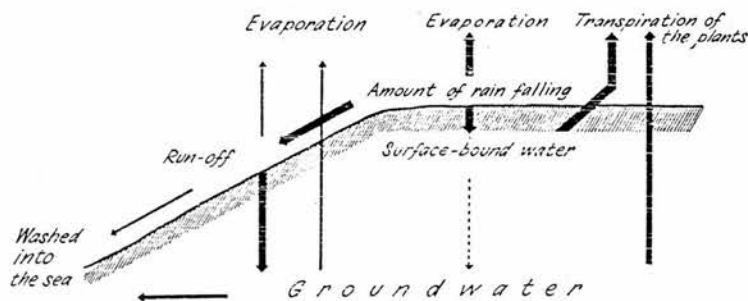


Fig (2.28) Schematic representation of water economy of arid regions (Walter, op.cit., p278).

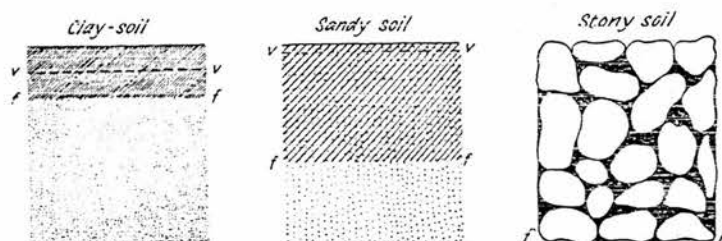


Fig (2.29) Schematic representation of the degree of penetration of equal quantities of rainfall in different soil. f-f, Lower limit of wet soil after rainfall; v-v, lower limit of water which evaporates. The clay soil loses half the water, the sandy soil about 10% and the stony soil practically nothing (Ibid, p280).

penetration of rain water, which depends on soil texture. The soil which holds the water in the upper layers will dry more quickly than the rest. Fig (2.29)) shows a schematic representation of the degree of penetration of equal quantities of rainfall in different soil types. Therefore in arid areas, under uniform climatic conditions, one finds trees on stony soil, grass on sandy soil, while clay soil remains nearly barren of vegetation [48].

### **Summary**

Desert soils are characterised by their lack of breakdown of mineral structure from the parent rock, poorly developed soil horizons and a very low humus content. More than 96 percent of the ground surface of Egypt has desert soil. This is dominated by lithosols, limestone, sandstone and sand.

Plant life on desert soil is dependent on the depth of soil, the structure and components of the soil and its ability to allow water to drain down through it and be stored at levels which can be reached by plant roots.

The new reclaimed desert areas have had some difficulties, such as salinity, water logging, sand dune encroachment and land degradation by wind. The salinity problem is the most critical one. It depends on the water balance relating to the ratio of evaporation to drainage. This relationship is influenced by climate, geomorphological, topographical, hydrological, soil and plant cover conditions. Irrigation management is one of the most important factors which could stem the development of salinity in desert areas.

Water penetration of the soil depends on the soil type and the run-off from the surface. In arid regions soil texture has the opposite effect on water-plant relationships to that in wet areas. The soil which holds the water in the upper layer will dry more quickly than the

rest. Clay soil will dry more quickly than sandy soil, which in turn will dry faster than stony soil.

## 2.4 CLIMATE

The interacting variable forces of wind, precipitation, temperature, humidity and solar radiation are the great climatic sources that have shaped the landscape and the community structure of the desert and to which, historically, people have adapted [49].

The Egyptian desert lies in the zone of hot, dry climate which is characterized in general by the high capacity of the atmosphere to acquire evaporated water, with extremely hot, dry summers in which the sun shines continuously from a fiery sky and humidity is low.

### 2.4.1 Climatic factors

The climatic factors which form the Egyptian desert environment could be described as follows.

#### **Solar radiation**

Solar radiation is a form of electromagnetic energy. The intensity of solar radiation, at any point in time, will depend on the altitude of the sun, the declination of the sun and what dust, water vapour and cloud cover obscure the sun's rays. In general, most radiation is formed into two broad bands encircling the earth between latitudes 15° north and 35° south [50] (Egypt lies between 22° and 32°). The seasonal global radiation for Egypt has been illustrated in Fig (2.30). From the maps, it is clear that there is a high amount of radiation throughout the summer months.

Glare is another problem as a result of continuous sunshine. From Fig (2.31) it can be seen that the average for cloud cover is very low in comparison to the annual hours of sunshine. The absence of cloud not only means exceptionally high temperatures and glare by day, but also sudden cooling at night as the direction of heat radiation is reversed.

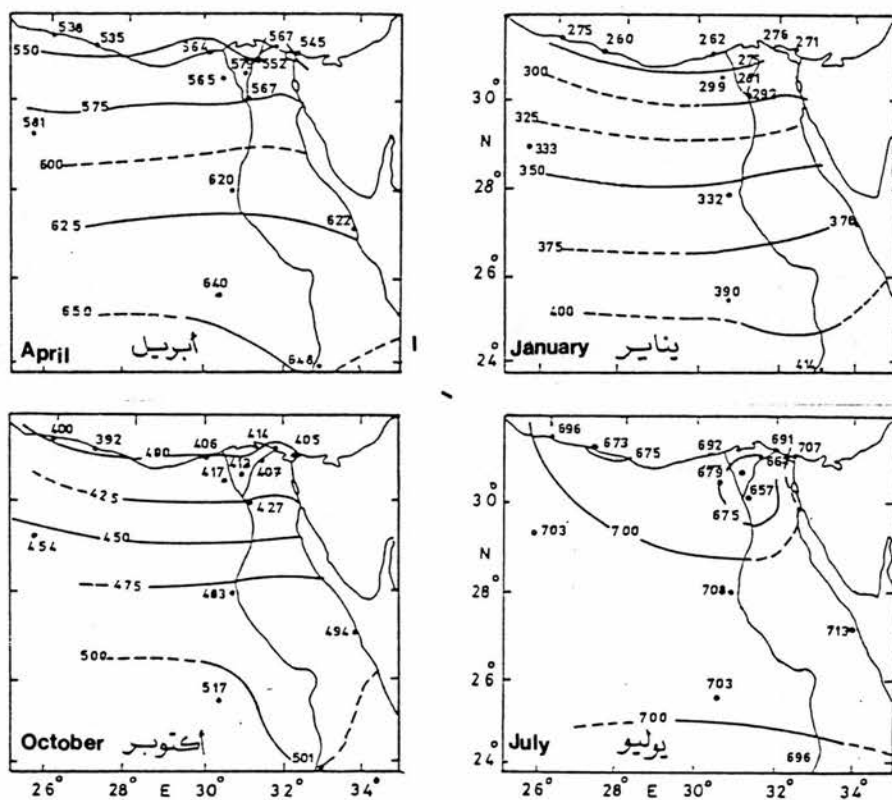


Fig (2.30) The seasonal global radiation for Egypt (op.cit., Monir, p21).

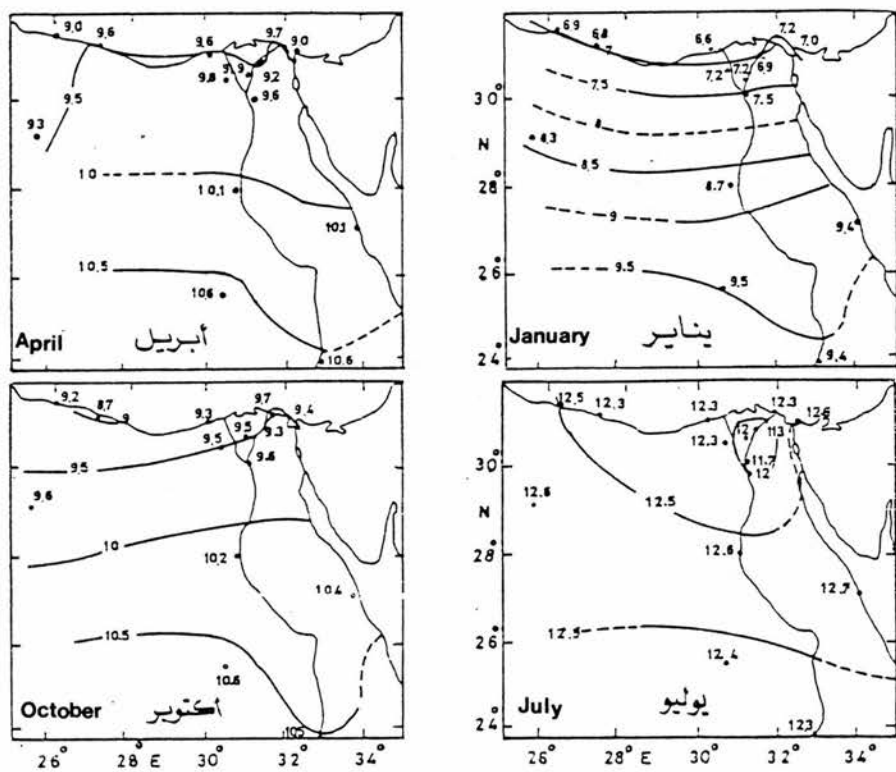


Fig (2.31) The sunshine distribution in Egypt (Ibid, p22).



Fig (2.32 ) shows that a large percentage of radiation reaches the ground in an arid zone, but most of it is, however, lost at night.

### **Air temperature**

Temperature is a measurement of mean kinetic energy (heat). The rate of heating and cooling of the surface of the earth is the main factor determining the temperature of the air above it. Soil particles, for instance, enclose a great deal of air which is an effective insulator and therefore a relatively thin surface layer of land heats and cools quickly, so that in hot deserts the surface temperature may become very high (Fig (2.33)). At the same time, it is important to consider the diurnal (day and night) variations in temperature in arid zones [51].

In Egypt the warmest months are July and August. However, May, June, September and October also experience high temperatures which exceed 30°C. The coldest month is January, with a mean temperature of about 13°C. The diurnal range of temperature is greater in April, May and June (about 17°C); in winter it is relatively small. Fig (2.34) shows the mean temperatures through the year.

### **Wind**

Wind effects temperature, evaporation, the rate of moisture loss and transpiration from vegetation. The wind pattern in Egypt can be much more stable than in Europe [52]. There are four wind directions in Egypt (Fig (2.35)). The dominant wind always blows from north or north-west to south and is most prevalent in summer and autumn. Generally, it is light to moderate so housing tends to be concentrated in the north of a town. Occasionally during winter it is fresh to strong and accompanied at times by rain showers. It is also associated with fog or mist in stable weather conditions.

The light to moderate north-east wind is the most prevalent in

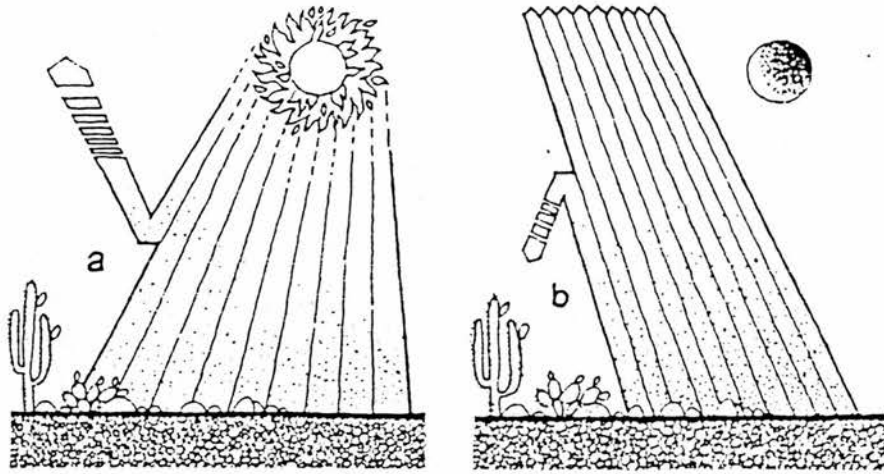


Fig (2.32) In arid zones a large percentage of the radiation reaches the ground (2); most of it, however, is lost at night (Kanya, A., "Design Primer for hot climates", London, 1980, p10).

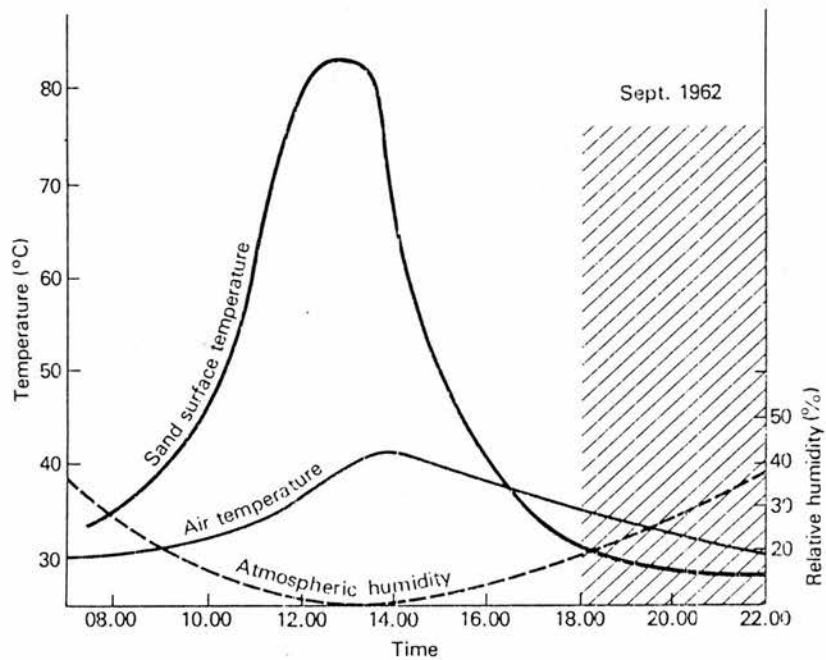


Fig (2.33) Example of extreme sand surface temperature measured at Wadi Halfa in the Sudan in relation to atmospheric temperature and humidity (Louw, op.cit., p7).

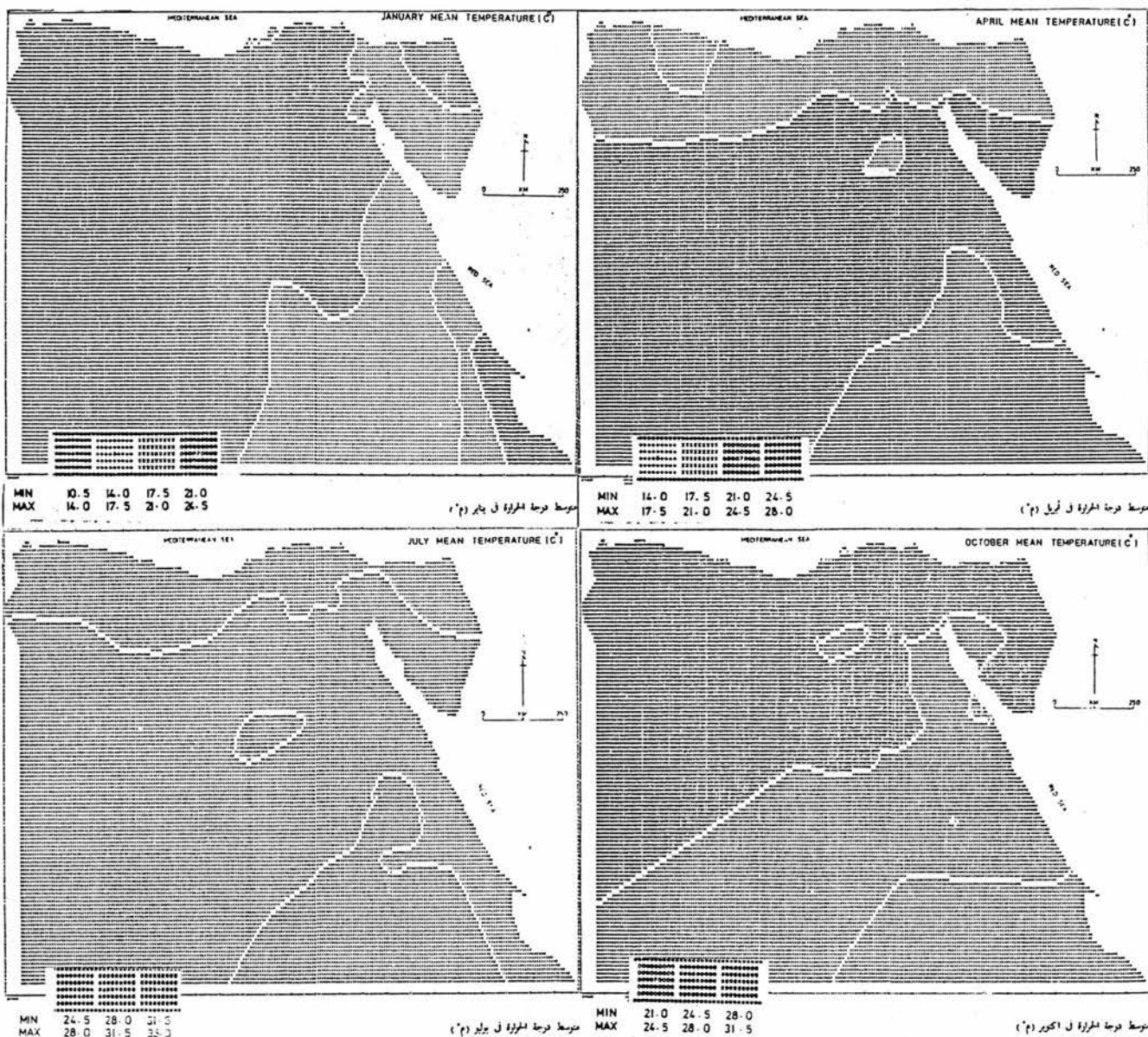


Fig (2.34) The mean temperature through the year, Egypt (Ali, A., "Climatic Atlas of Egypt", Cairo, 1982, p16,19,22,25).

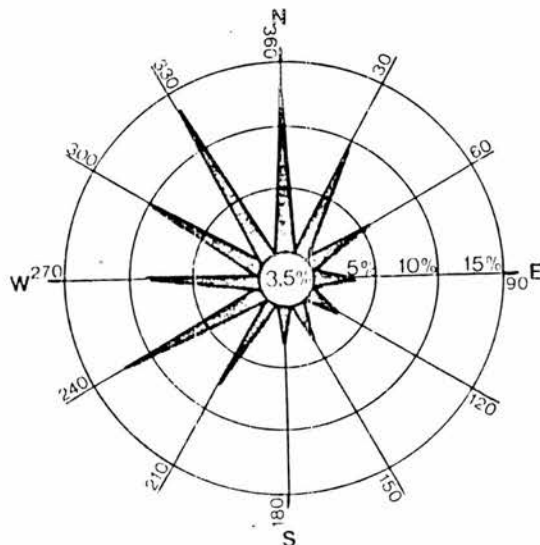


Fig (2.35) Annual percentage frequency of surface wind direction (SWECO, 10th of Ramadan Master Plan, 1976, p34).

transitions. It is associated with early morning fog and mist. The east to south-east wind is fresh to strong at times of transition. The south to south-west wind blows throughout the year, but is most prevalent in winter. It is the most serious wind, as it causes the sand to rise, and is known as "Kharmsin". It is a hot, drying wind which increases aridity and creates sand or dust storms; it can also increase heat stress in plants and cause wilting. Table (2.2) gives examples of the frequency of this wind in Egypt. Dust deposition rates in Egypt from these storms has been estimated to be  $131 \text{ ton/km}^2$ , which increased to  $223 \text{ ton/km}^2$  in areas near quarries [53].

*Frequency of moderate and severe dust storms (J. Oliver)*

|      | J | F | M | A | M | J | J | A | S | O | N | D | Total |
|------|---|---|---|---|---|---|---|---|---|---|---|---|-------|
| 1940 | 1 | 1 | 1 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8     |
| 1944 | 3 | 4 | 4 | 1 | 3 | 1 | 2 | 2 | 0 | 1 | 0 | 0 | 21    |

**Table (2.2)      Frequency of moderate and severe dust storms (Walter, op.cit., p488).**

## Evaporation

The amount of evaporation is highly dependent upon the location. Values for a town will be different from those taken only a few kilometres away at its outskirts. The difference will mainly be due to variations in wind speed.

The mean seasonal amounts of evaporation in mm are shown in Fig (3.36). It can be seen that the mean daily values are very high at Aswan in the south and at Kharga in the middle, in contrast with Alexandria in the Mediterranean coastal area.

In general, the monthly variation of mean daily values on the Mediterranean coast is very small, with the highest values occurring in summer. On the Red Sea coast, the observed values are much higher due to the effect of greater wind speeds and lower humidity. For inland

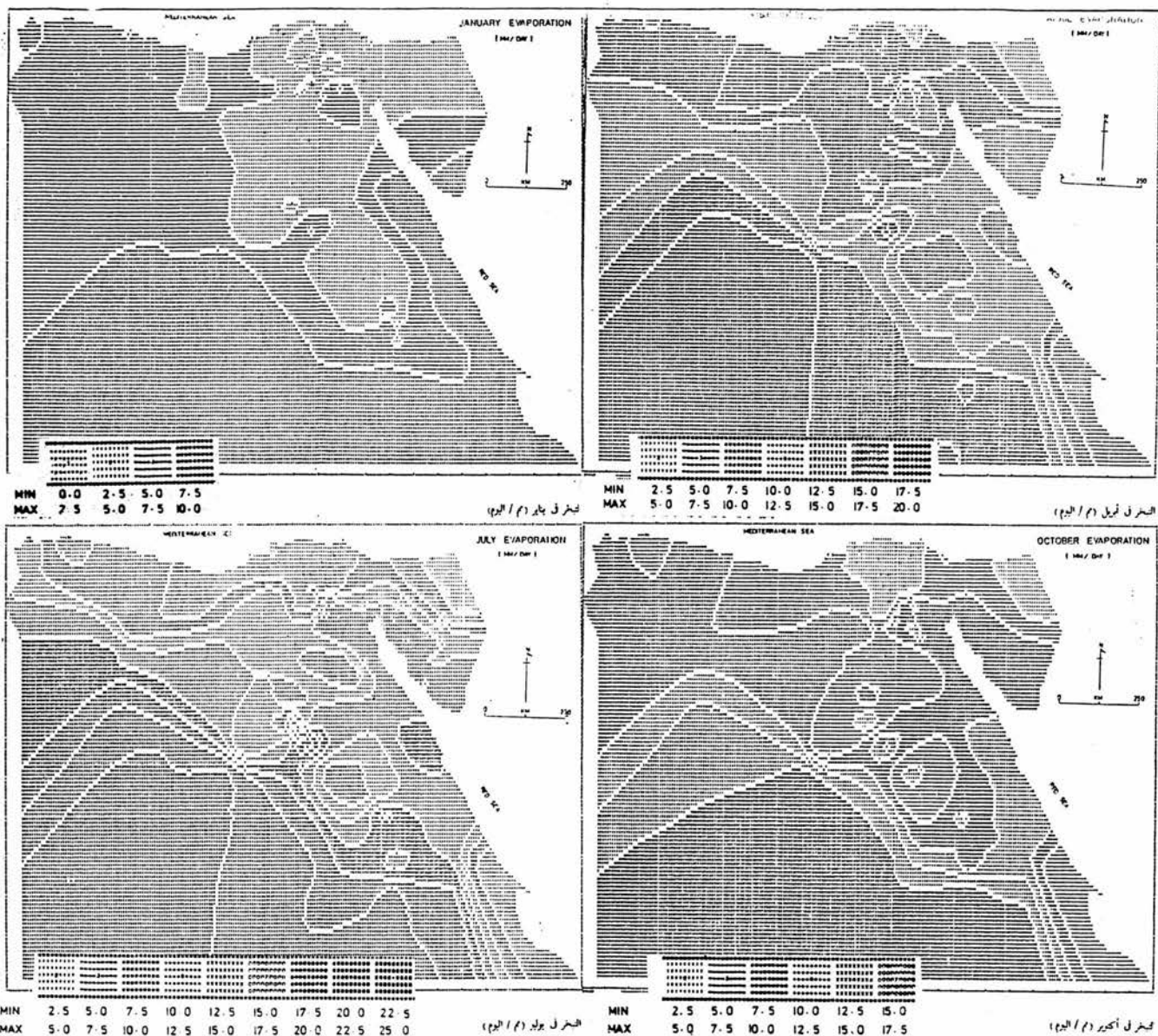


Fig (2.36) The mean seasonal amount of evaporation in Egypt (Ali, A., op.cit., p40,43,45,49).



areas, the variation is large, especially in the southernmost areas (south of  $28^{\circ}\text{N}$ ) where monthly means vary from 8 mm (January) to about 24 mm (June and July). The main effect of high evaporation in desert areas is to help in the formation of saline soils.

### **Relative humidity**

The term "relative humidity" refers to the water vapour content of the atmosphere gained as a result of evaporation from exposed water surfaces and moist ground and from plant transpiration.

In general, humidity in Egyptian weather is very low. Relative humidity values are graphed to show seasonal means (Fig (2.37)). It can be seen that in Mediterranean coastal areas the mean monthly values of relative humidity increase eastwards. The highest values are registered during July and August, while the lowest recorded values are in February and March (except for the Delta region). However, values decrease rapidly southwards. For example, the mean annual value is 70% at Alexandria and 27% at Aswan. It should be noted that the mean values for stations on the Mediterranean coast are appreciably higher than those on the Red Sea.

### **Precipitation "rainfall"**

Rains are few and far between. Precipitation sometimes starts at high altitudes, but evaporates before it reaches the ground. One important feature of Egyptian desert climatology is the relatively high variability of the rainfall with respect to time and place. The months of June, July, August and September are invariably dry for the whole country, except for a little rain in the coastal region. October is the first month that can be considered as a wet or rainy month. During November, December, January, February and March, the rainy zone advances very quickly to cover the whole coastal region and most of the Delta, though not the southern part of the country. All of the country north



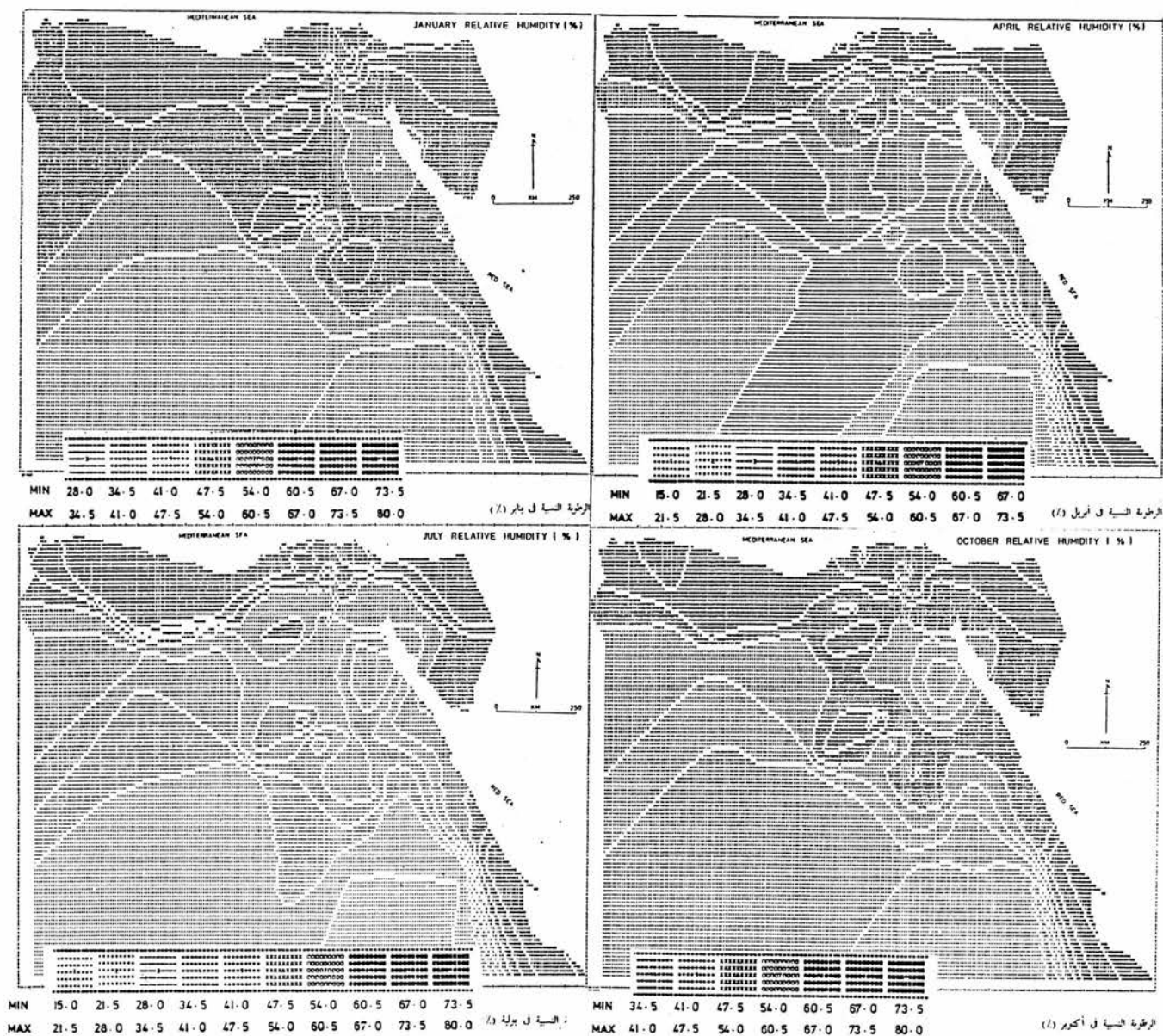


Fig (2.37) Relative humidity in Egypt (Ali, A., op.cit., p52,55,58,61).

of latitude  $28^{\circ}\text{N}$  receives at least 70% of its annual rainfall during these months. Fig (2.38) shows the mean seasonal distribution of rainfall: the Mediterranean coastal belt (100-150 mm), Middle Egypt with latitude  $29^{\circ}\text{N}$  (20-100 mm) and Upper Egypt (10 mm occurs once every ten years).

#### 2.4.2 Ecological impact

The interaction between climatic factors and the desert environment has a great influence on the landscape within the desert ecosystem. Paradoxically, the Egyptian desert's extreme temperatures will be an even greater problem in the new settlements than in the desert itself because there will be more hard surfaces to collect and re-radiate heat. The surface temperature for 10th of Ramadan City is illustrated in Fig (2.39) and it shows how high surface temperatures can rise. At the same time, in summer the height of the sun in the sky makes it impossible to provide effective shade from a simple, vertical form such as a wall. The extreme temperature of desert areas has an enormous effect on the daily life cycle of man, wildlife and plants. The radiation environment, to which desert animals and plants are typically accustomed, is illustrated in Fig (2.40).

Desert organisms can, however, reduce the solar load very significantly through reduction of the surface area exposed to radiation by the orientation of plant leaves or, in the case of animals, orientation of the long axis of the body relative to the sun's rays. Even for buildings, the basic defence against heat and glare is to build cities with a large bulk and a small surface area exposed to the sun's rays. The size of the organism is also a very important consideration when evaluating the interacting effect of wind speed and temperature gradients upon the thermal ecology of desert organisms.

Solar factors do not always have a passive effect. Kassas and Imam

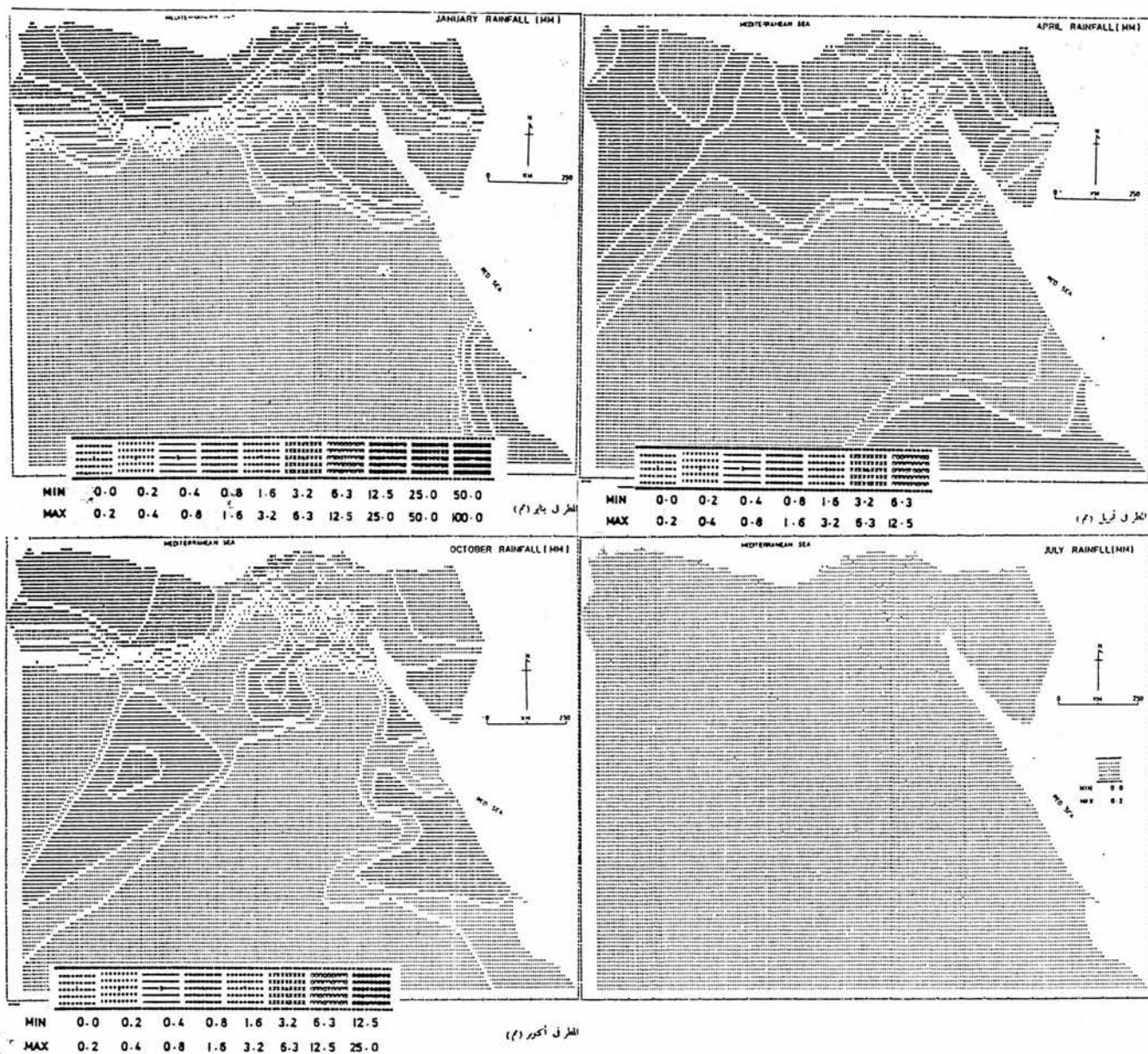


Fig (2.38) The mean rainfall distribution in Egypt during the year (Ibid, p62-65).

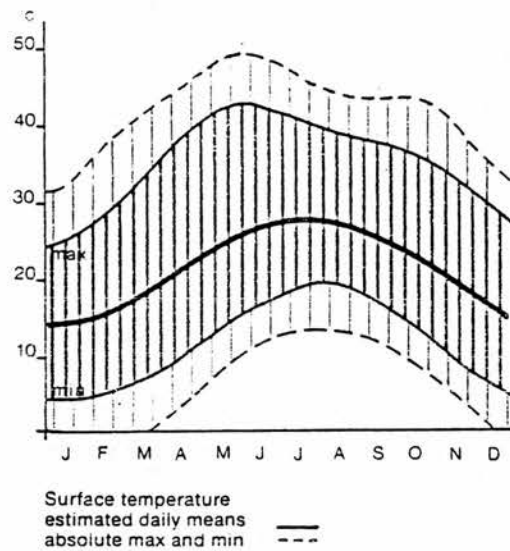


Fig (2.39) Surface temperature of 10th of Ramadan (SWEEO, op.cit., p12).

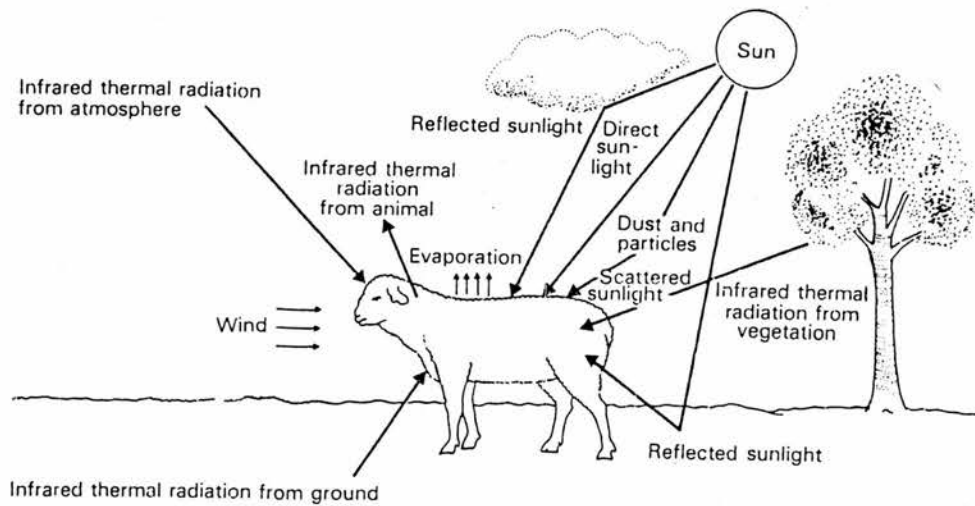


Fig (2.40) The radiant environment (Louw, op.cit., p8).

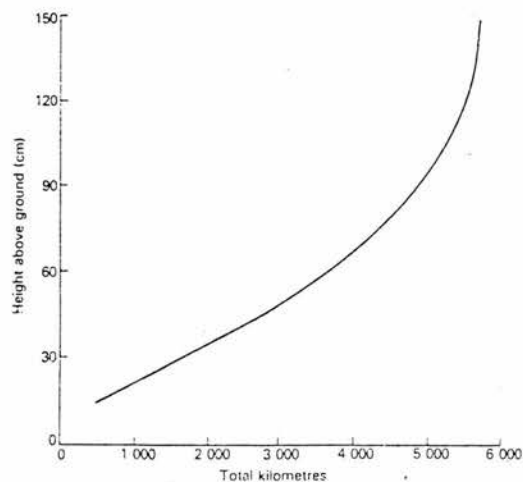


Fig (2.41) Wind gradient above the surface of the ground shows how wind speed increases exponentially with increase in height above the ground (Louw, op.cit., p14).

did micro-climatological temperature measurements on the south and north slopes of hills. As expected, the differences were greatest at low sun position in January. This is important in so far as the main growing season is in the winter. Only in this season can the soil of the south sloping hills support a reasonably dense carpet of ephemerals after rain, while the north slope is almost bare of vegetation because, due to the sun's low position in winter, it does not receive enough direct sunlight to enable vegetation to grow as well as it does on the south slope [54].

It is relevant to consider wind as a factor in the desert environment. Wind plays an active part in convection and evaporative water loss by the desert organism. Wind remains an important abiotic factor in the ecology of the desert, frequently producing spectacular dust or sand storms with pronounced abrasive and desiccating action, particularly on delicate ephemeral plants. There is no doubt that wind has a profound effect on the distribution and form of desert plants and animals. The effect on animals is perhaps less severe because of their ability to escape to a favourable microclimate. The most desiccating conditions, which cause most human discomfort, are created by the onset of hot, dry, dusty winds originating from the interior, like the kham-sin. In general, winds which come from the desert will be much hotter than the ambient urban air temperature. Therefore, it is necessary for the designer to provide some external spaces which will be sheltered from the hot, dusty winds coming from whatever direction, and other external spaces which catch the wind when it is cool. The courtyard building form is one of the ideal solutions to provide an outdoor space which can remain relatively free of dust.

Also, when evaluating the effect of wind on desert animals and plants, it is important to consider the boundary effect at the surface



as illustrated in Fig (2.41). From this, we find that the smallest animals or plants on the surface are exposed to minimal wind effects. The same principle can be found in the traditional settlement where buildings are low in height and compact in form, which means the wind effect is minimised.

### **Summary**

Climatic factors have an important influence on shaping the landscape and the community structure in desert areas. The climate of the Egyptian desert is basically characterised by: high amount of radiation throughout the summer period and a high temperature in summer with a remarkable diurnal variation in temperature. There are four main wind directions in Egypt; they are dominated by the north to north-west wind. The south to south-west wind can be the most harmful when it causes sandstorm winds (khamsin), especially in spring time. The evaporation rate is generally great, especially in summer, and humidity tends to be very low and is affected by the relative proximity to the Mediterranean and the Red Sea. It decreases rapidly from north to south and from east to west. Rainfall is generally sparse and is variable as to time and place.

The ecological facts show the importance of first gaining a working knowledge of the most important physical principles associated with terms such as radiation, heat, temperature and wind. They provide good principles which should be respected in any design. In general, climate should be one of the main planning considerations at each stage of the design process from regional level to detailed design.

### **2.5 ARID PLANTS**

In arid areas, the most obvious characteristic is a scarcity of vegetation cover, which ranges from nothing visible to an open stand. A closed cover is seldom attained. The other characteristic is the



seasonality of vegetation [55].

It is clear that arid areas, especially deserts, have low biomass. In the hotter, drier deserts of the world biomass is often zero. Table (2.3) gives a list of biomass values for some major world vegetation types and enables a comparison to be made between deserts and other zones.

| Zone                          | Biomass<br>(cntr/ha)* |
|-------------------------------|-----------------------|
| Tropical rain forest          | 5000+                 |
| Broad-leaved temperate forest | 3700-4100             |
| Northern taiga spruce         | 1000                  |
| Savannah                      | 700                   |
| Dry savannah                  | 200-300               |
| Steppe grassland              | 250                   |
| Dry steppes                   | 100                   |
| Semi-shrub desert             | 40-45                 |
| Subtropical desert            | 10-15                 |

\* One centner (abbreviated cntr) = 50 kg;  
One hectare (abbreviated ha) = 2.47 acres.

**Table (2.3)      Biomass in various major vegetation zones (Godie, op.cit., p23).**

### 2.5.1    The classification and nature of desert plants

Desert plants are characterised by the ways in which they adapt to drought conditions. It is possible, as shown by M. Kassas (Egypt), to separate the vegetation of dry lands into four major orders [56].

Accidental forms:

Only ephemeral plants (although not all) are included in this order. These plants grow only when rain occurs.

Ephemeral forms:

There are three categories in this group; the succulent ephemeral form is the first one. They grow for six to eight weeks and have the ability to store some moisture in their tissues. They can tolerate the severe conditions prevalent in soil which develops on erosion pavements, such as rediments, regs and hamadas. Typical plants can be further

subdivided into three types (winter ephemeral, summer ephemeral and salt-marsh ephemeral).

The second group is the ephemeral grassland form. This form can develop into grassland over large stretches of ground and in particular on shallow sand drifts.

The herbaceous ephemeral form is the third one. These herbaceous ephemeral plants are only found on soft deposits in good locations where the water supply is preserved, even if only for a short while.

Ephemerals have no need to develop xerophytic or drought resistance properties because their seeds remain dormant in the soil until the next major rainfall. They make up 50-60% of desert plants.

Suffrutescent (sub-shrub) form:

They are a widely spread order. There is a permanent flora of perennial species and it includes a perennial grassland form. There are three layers: a suffrutescent layer, 300-1200 mm high, a grassland layer of the same height and a ground layer. There are three categories (succulent sub-shrub form, perennial grassland form and woody perennial form).

Frutescent perennials (shrub form):

This form is typical of all the vast desert scrublands. There are three layers: frutescent (1200-3000 mm), suffrutescent (below 1200 mm) and ground level.

The succulent perennials of tropical Africa and Arabia are part of this category. Scrubland can only be found in good locations where there is adequate soil and rainfall, and where surrounding mountains supply run-off water. Scrubland indicates the highest level of water reserves available in the desert, and is particularly relevant to semi-arid areas

### 2.5.2 The common features of desert plant communities

Each community is generally dominated by one species which gives it its visually uniformity. It has a number of species associated with it which may or may not be linked to any particular community type. It is characterised by the frequency or density of species rather than by the presence or absence of any particular species. Each habitat has a distinct community associated with it.

The root types play an important part in shaping the community, for example:

Ephemeral plants - shallow surface roots, no deep penetration. They dominate the extreme areas; because of their shallow roots, they can take immediate advantage of any rainfall. These roots are perfectly adapted to exploit the limited water supply.

Succulent perennials - both deep and shallow roots. They are found in the less extreme desert and, because of their special moisture-storage ability, can develop deeper roots, which tap the moisture layers lower down.

Wood perennials - predominantly deep roots with some shallow roots. They have a higher water demand and are found in different and generally less arid conditions. Fig (2.42) shows root penetration patterns for desert vegetation.

### 2.5.3 Distribution of vegetation in the Egyptian desert

The habitat and vegetation of the commoner ecosystem of the Egyptian desert could be described according to climatic-geomorphologic units as follows [57]:

- I Hyperarid Eastern Desert region.
- II Hyperarid Western Desert region.
- III Arid Mediterranean desert region.

The research will concern itself here with the areas where the

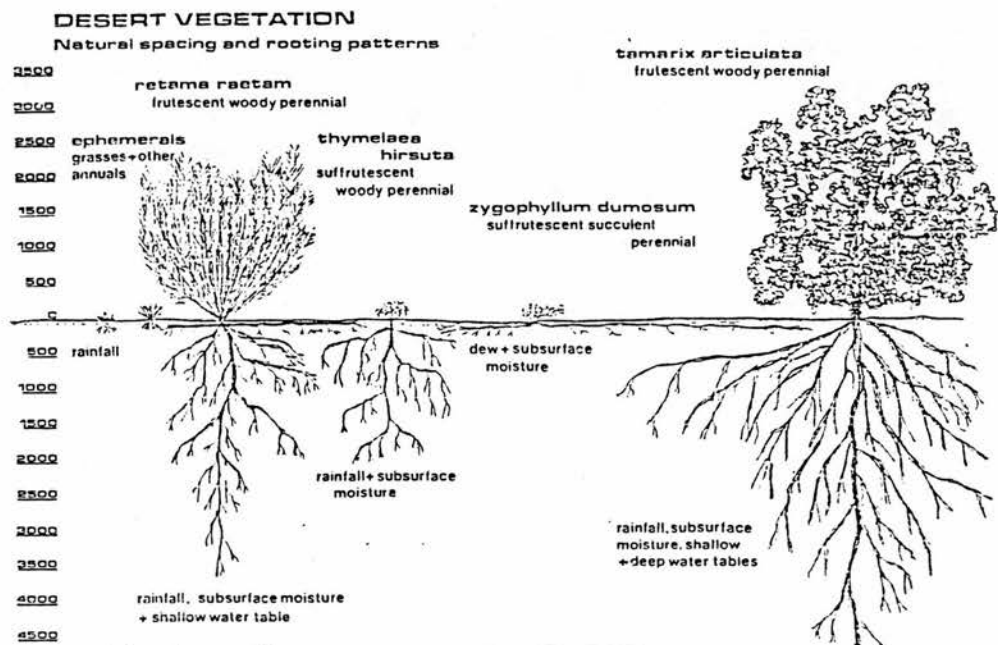


Fig (2.42) Desert vegetation, natural spacing and rooting patterns (Adams, R., et al., "Drylands: Man and Plants", London, 1978, p44).

Egyptian New Towns are located in areas which have similar conditions. These will include the part of the "Arid Mediterranean desert region" which can be divided into: wadis, gravel desert and Western Desert.

Before these areas are examined, it should be noted that all of the plant communities added together cover less than 1% of the total surface of the Egyptian desert [58].

### **Wadis**

On the limestone plateau to the south-east of Cairo, Kassas and Imam described the successional trend of communities in ecosystems of Wadi Digla, Wadi Liblab, Wadi Haf, Wadi Rashid and Wadi Garawi.

The barren rock surface is occupied by a community dominated by Stachys aegyptiaca and other species. At the same time, the shallow wadi beds are occupied by a community co-dominated by Anabasis setifera and Zygophyllum coccineum.

The parts of wadi beds where the soil depth increases to 50 cm are occupied by a community dominated by Zilla spinosa and other species. Where the soil depth of wadi beds becomes deeper than 50 cm, different types of grassland communities become established, e.g. Pennisetum dichotomum (silty soil), Desmostachya bipinnata and Panicum turgidum (alluvial and silt).

Terraces, which represent the oldest type of habitat in wadis, are occupied by scrub community types. The dominant species are usually wood bush, e.g. Atriplex, Lycium arabicum, Tamarix spp.

### **Gravel desert**

On the gravel hillocks, the community is dominated by Centaurea aegyptiaca along with other common associated species.

In the runnels dissecting the gravel hills, there are communities dominated by Artemisia monosperma, Haloxylon sclicormicum, Lasiurus hisiatus and Zilla spinosa.

## **Western desert**

The transition between the arid attenuated and the arid accentuated provinces of the Mediterranean Western Desert of Egypt is characterized by communities dominated by Anabasis articulata, Salsola teteandra and Thymeaea hirsafa near the coastal region. Further south, the communities are dominated by Artemisia monosperma, Convolvulus lanatus and Helianthencum lippi. Within the northern limits of the arid accentuated province, the communities become dominated by Mottkiopsis ciliata.

### **2.5.4 Plant selection**

Selection of plant material for new urban areas has been empirical mainly on the basis of functional requirements. The function of plants could be considered under the following headings: environmental, structural and aesthetic [59].

In arid climates, the use of plant material is a prime environmental factor whatever the importance given to architectural or other factors. Plants (the building materials of the green landscape) play a great part in providing a comfortable climate and microclimate. On the other hand, plants may also be selected as structural elements according to planning and architectural values, that is for their characteristics of form, colour, texture, scent and seasonal variation.

### **Selection of indigenous plants**

The selection of indigenous plants, rather than introduced species, is of great importance in fragile, arid lands where preservation of the ecological balance is a prime necessity [60]. Indigenous plants are highly adapted to such precarious conditions.

Egypt is building and planning urban developments in desert areas. These developments have stimulated the desire for vegetation, especially ornamental trees and shrubs to soften the built-up image. New design criteria, whether for flowers, leaf shape or colour, or plant form, are



selected and, because indigenous plant species are seldom available locally and moreover often lack these aesthetic qualities, they tend to be overlooked, especially as publicity tends to be more blatant for the particularly spectacular introductions.

As a result of lack of knowledge about indigenous plants, greater encouragement is given to the importation of common widely known plant species and little is given to the production of indigenous plants [61].

The introduced plants necessarily come from a different environment and so require land modification and specialist treatment, involving the physical changing of the character of the land and requiring additional water to help them adapt to their new habits [62]. They also provide little faunal habitat. This seems a serious problem.

Because of this situation, an attempt to identify some of the useful indigenous plants in the wild has been made by the author with the help of plant taxonomist Dr. S. El Nagar. Most of the common plant material (Index I, Part I) used in landscape design in Egypt today has been introduced from other regions and these plants have little or no ability to adapt to the desert environment (drought, salinity and wind resistance). There is a great lack of plant cover, especially for shrubs and ground cover. For this reason, more attention has been given to collecting wild shrubs and ground cover plants from the desert areas around the Egyptian New Towns. These species have been illustrated in Index I, Part III.

#### 2.5.5 Plant materials index

This section is primarily concerned with illustration of native and cultivated woody plants of all types, from ground cover to trees. Most of the listed plants are in very common use for landscape sites in Egypt.

All plants listed have been selected empirically from identifica-

tion within the area. The index of plants is classified as follows:

Part I (trees, palms, shrubs, climbers, succulents, ground cover)

Part II (fruit trees which have been used for new reclaimed desert areas)

Part III (some of the indigenous shrubs and ground cover which have been collected by the author from the E.N.T. sites) (see Plant Index). The effects of grazing on natural plant communities will be discussed later in Section 2.7 Ecology.

### **Summary**

The scarcity and seasonality of vegetation are the most obvious characteristics for arid areas. All the plant communities added together would cover less than 1% of the total surface of the Egyptian desert, and the ephemeral makes up 50-60% of these desert plants. The other suffrutescent and frutescent types make up less than 50%.

Each desert habitat (wadi, plain, gravel, etc.) has a distinct type of plant community associated with it. Each community is always dominated by one species which gives it visual uniformity.

The selection of indigenous plants, rather than introduced species, is of great importance in fragile, arid land where the preservation of the ecological balance is a prime necessity.

### **2.6 WILDLIFE**

On desert land, the productivity of a desert ecosystem is slow. It provides habitats for only a limited number of birds and other wildlife in comparison to those found in, for example, wetland. The main reason for this is the scarcity of water. The interference of man also has a great effect. In almost all desert areas today, wildlife problems are acute. However, rocky, inaccessible desert habitats have survived better than rolling hills and plains that are more easily occupied, used and travelled through [63].

The wildlife of the Egyptian desert may be described as follows.

### 2.6.1 Fauna

Generally speaking, there are differences between the faunas of the two deserts on either side of the Nile. The fauna of the Eastern Desert is related in the northern part to the Sinai, Palestine, the Arabian Peninsula and Western Asia. In the southern part, the fauna has a more clearly Mediterranean character than would be expected. The mountains of the Red Sea may act as a barrier between north and south.

The fauna of the Western Desert is also more or less Mediterranean in its northern part, immediately south of the coastal belt and including Siwa, the Qattara, Faiyom and Minya. Further south, the fauna is typically Saharan and is related to the fauna of the central Sahara [64].

#### **Mammals**

According to Wassif (1976), the mammal fauna of Egypt comprises 10 to 11 Palaearctic species and has a strong African (Ethiopian) character. This is confirmed in the case of the Chiroptera (bats) where the index of faunistic affinity is 25 between Egypt and Europe and 45 between Egypt and Africa. Desert mammals common in Egypt and on both sides of the Nile include Dorcas gazelle (Gazella dorcas), Cape hare (Lepus capensis), jackal (Canis spp.), Rüppel's fox (Vulpes rueppeli), Libyan striped weasel (Poecilictis libyae), common genet (Genetta genetta), white-tailed mongoose (Ichneumia albicauda), striped hyaena (Hyaena hyaena), serval (Felis serval), caracal (Lynx serval) and rock dassie (Procavia capensis) [65].

The rodents are in many ways the most important group of mammals in the ecosystems. Some rodent species attack agricultural land and crops. It is possible that the desert rodents (Gerbillus, Meriones and Dipodidae) also contribute to the destruction of desert vegetation in the

Cairo-Suez area as, when land is reclaimed, rats begin to appear [67]. Osbonu and Helany recognized that most rodents were not in danger of extinction. Fig (2.43) shows some of the wild animals in the Egyptian desert.

## **Birds**

The combination of both the geographical position and the great diversity of habitats in Egypt makes it of particular importance to many types of bird life.

Of the 430 bird species occurring in Egypt about 150 are resident breeding birds; the rest are either migratory or winter visitors. The resident birds of Egypt belong mainly to two zoogeographical regions: the Palaearctic and the Ethiopian. Most of the resident breeding birds are confined to the lush green area of the Nile Valley and Delta and some of the Western Desert oases [66].

The mountains of Sinai and the Eastern Desert hold many resident birds, mostly semi-desert birds with a few typical mountain birds. Many of the breeding birds of prey are also found there.

The Red Sea with its rich ecosystem offers a suitable habitat for 15 breeding species of waterbirds and seabirds.

Birds adapted to desert life inhabit wide areas of the Egyptian desert. Birds like the hoopoe, lark and the bar-tailed desert lark are found throughout most of the Egyptian desert and are specially adapted to life under the harshest desert conditions.

Each autumn and spring, thousands of millions of migratory birds pass through Egypt from Eastern Europe and Central Asia to or from East and South Africa.

In winter Egypt hosts a multitude of birds and it is particularly important to wintering waterbirds, as the northern Delta acts as a major refuge for many species of ducks and waders wintering in the Mediterranean.

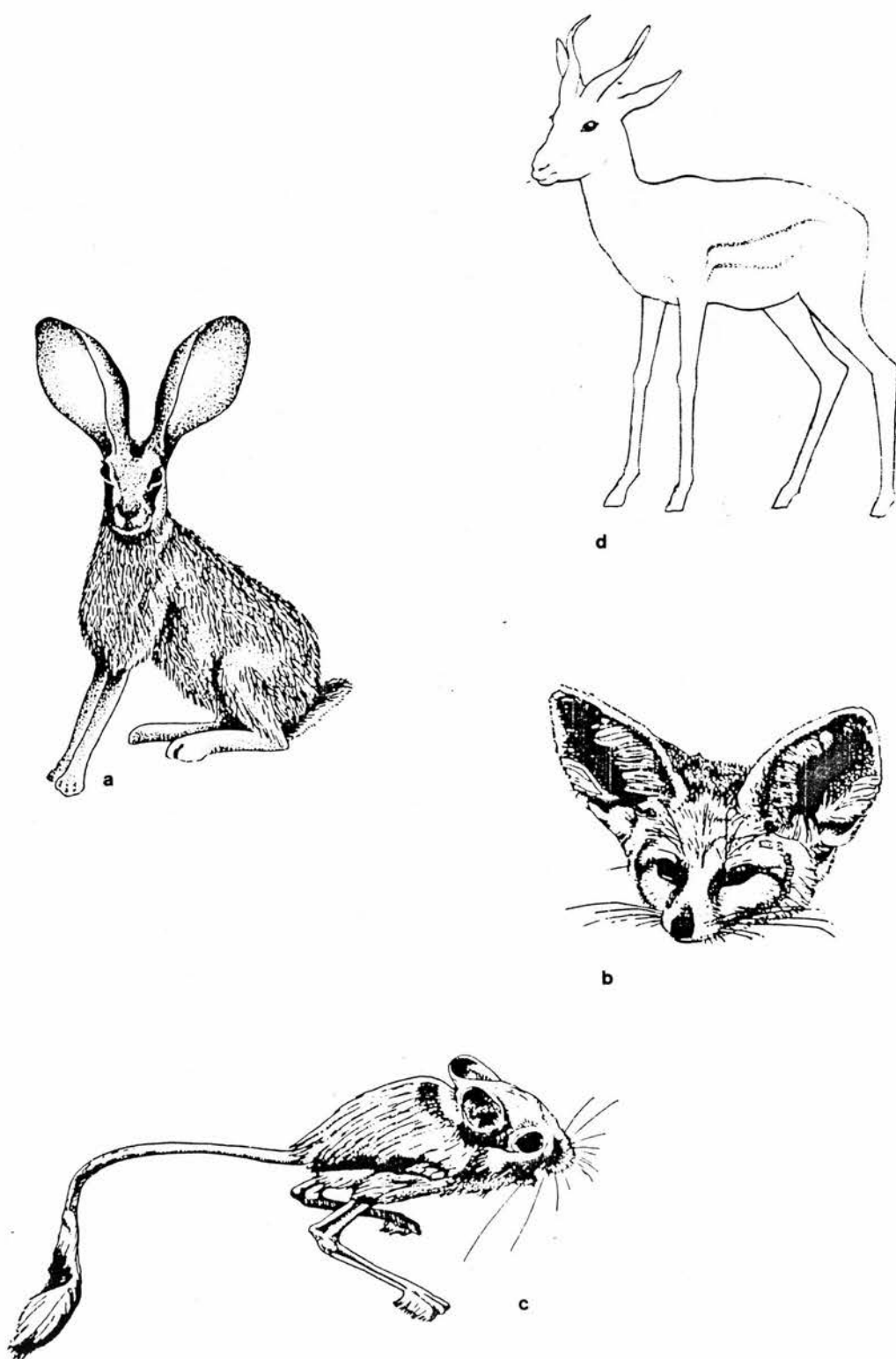


Fig (2.43) Some of the wild animals of the Egyptian desert (Louw, op.cit., p54,150) (a - Jack rabbit, b - Sahara fennec fox, c - Sahara jerboa, d - Dorcas gazelle).

ean. Hunting pressure in Egypt today as in earlier times is mainly directed towards waterfowl. Among desert birds, the ostrich has disappeared because of hunting and the collection of its eggs. The desert partridge is hunted by the 200 members of the Cairo Shooting Club when the duck season is over [67]. Fig (2.44) shows some of Egypt's common birds.

### **Reptiles**

The Egyptian herpetofauna comprises some 93 species, with the highest affinity exhibited towards South-western Asia, Western North Africa and the Red Sea coastal regions (Eritrea, Ethiopia, Somalia) in descending order. The percentage of Egyptian fauna occurring in these regions is 68, 40 and 37 respectively.

The number of species decreases from the north of Egypt to the south and from east to west. Vegetated and irrigated areas are the most favourable niches for reptiles. Lizards and snakes are the most common reptiles in the Egyptian desert [68].

### **Invertebrates in general**

Rzosk has pointed out that invertebrate groups in Egypt have attracted more attention than the flora and the vertebrates, but what has been done reflects the dry character of the area, especially in a number of insect groups.

The presence of the Nile in the middle of the area is an important feature that must be referred to. There is a narrow selection of groups and species fit for life under desert conditions [70].

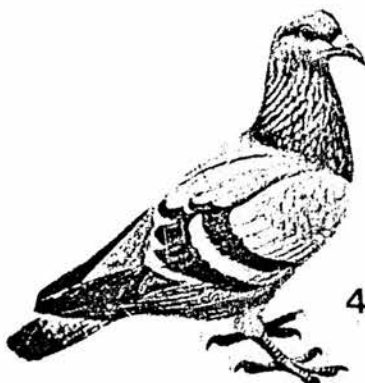
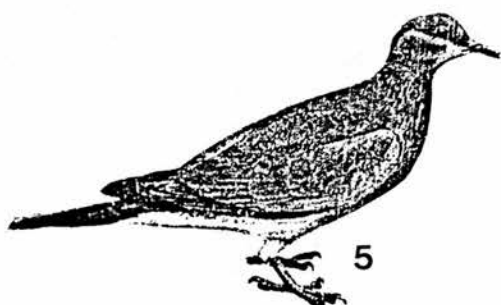
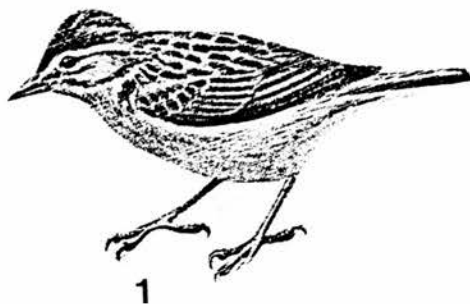
### **Butterflies**

No comprehensive zoogeographical study has been done for the whole area.

### **Locusts**

Locusts are traditionally one of the great scourges of Egypt. It





1. Short-toed lark, Calandrella cinerea  
Very common passing migrant found in field and desert, usually in flocks. Its call is a sparrow-like chirp.
2. Bar-tailed desert lark, Ammomases cincturus  
Common resident breeding bird of the desert. Found in pairs or small flocks.
3. Rock martin, Ptynoprague rupestris  
Common resident breeding bird found in mountains.
4. Laughing dove, Streptopelia senegallus  
Abundant resident breeding bird in towns, villages and oases.
5. Rock dove, Columba livia  
Rather common resident breeding in mountain areas. Ancestor of the domestic pigeon, with which it often mixes. Usually found in small flocks.
6. Little owl, Athene nocturna  
Common resident breeding bird of open farmland and semi-desert. Partly diurnal. Has characteristic undulating flight. Call is loud and shrill. Preys on small animals.

Fig (2.44) Some of the common birds in the Egyptian desert (Common Birds of Egypt, Cairo, 1985, p18,28,32).

could be said that locusts have not been a danger in Egypt for several years, but in May 1988 the FAO put out a major locust warning. Swarms of desert locusts have reappeared in Sudan, Egypt and Saudi Arabia. The FAO say that the danger will come with the next generation. Winds may carry the locusts into the region from anywhere [71].

#### 2.6.2 General features of distribution

It is evident that the most prominent feature of biogeographic importance in the Egyptian desert is the Nile. The Nile tends to act as a barrier between the faunas of the Eastern and Western Deserts; at the same time, it serves as a link between south and north.

The Mediterranean coast has more species than the inner desert, and the fauna gradually becomes more impoverished from the northern parts of the Eastern and Western Deserts to their southern parts.

Desert fauna can be distinguished from Nilotic fauna along the Nile Valley and in the oases, with occasional but very limited incursions by one into the habitat of the other.

#### 2.6.3 The status of wildlife

There is no doubt that wildlife, especially mammals, has been declining in the Egyptian desert during the twentieth century. This decline may be associated with desiccation, but it is certainly more related to the incursion of firearms and mechanized vehicles (cars and now helicopters). Hunting has also contributed extensively to the declining numbers of larger mammalian species.

On the occasion of the declaration of the World Conservation Strategy and the statement from the Egyptian President's Office on 5 March 1980, a National Programme for Nature Conservation was prepared by the Egyptian National Committee for IUCN (Kassas, 1981). This includes proposals to establish a network of nature reserves in the following regions: Sinai, the Eastern Desert and Red Sea and the Western Desert

[72]. It should be noted that the new urban areas will affect the desert ecosystem and its wildlife. The new environment of buildings, paved surfaces and cultivated landscape will lead to changes in the habitat structure. The increasing industrialisation of today is widening imbalances and simplifying habitats, favouring the explosion of a few species at the expense of diversity. This does not mean that the new desert urban areas are a closed environment, as rural and desert areas will be connected through natural and man-made corridors. These corridors have greatly influenced the migration and perpetuation of wildlife in new urban areas.

### **Summary**

The desert ecosystem is slow in productivity, and it provides habitats for a limited number of wildlife species in comparison with wetland, but the new urban areas in the desert will provide some favourable habitats for certain types of wildlife. The variety and number of species increase in the northern part (near the Mediterranean) and decrease southward towards the inner desert. There is a difference between the fauna in the Eastern and Western Deserts. The Nile acts as a barrier between them and, at the same time, serves as a link between south and north.

### **2.7 ECOLOGY OF DESERT AREAS**

Desert ecology is very fragile, very delicately balanced and care must be taken to destroy as little as possible of the ecology and to modify the environment during development or it will be destroyed completely [107]. At the same time, the ecological factor nowadays plays an active part in planning development. McHarg, Lewis and other eloquent exponents of the environmental planning movement have brought into focus the evolving philosophy that ecological processes provide the indispensable basis for planning and design [72].

Most of the physical factors which affect the desert landscape have been examined in the previous sections, but here an attempt will be made to cross-examine the desert ecosystem.

### 2.7.1 The processes of the desert ecosystem

Most of the the whole complex of plants and animals have survived in desert environments by means of either escape or adaptation.

Escape may be either long-term (ephemeral) or short-term (retreat). In the long-term, the survival potential of ephemeral animals is theoretically greater in very arid desert. The ephemeral plants complete their life cycles in a short period under the available favourable conditions. On the other hand, retreat could be considered as short-term escape behaviour by desert animals. It usually assumes the pattern of a daily rhythm and can occur with or without a period of torpor. In between the two terms, there are different forms of escaping like diapause (rest), aestivation or seasonal migration.

**Adaptation** is of great importance to plants and large animals that are unable to escape from the exigencies of the desert environment. Adaptation may be morphological, physiological or behavioural.

The principal characteristics of desert plants have been tabulated by Solbring & Orians (1979) (Table (2.4)).

|  | <i>Drought evaders</i>   | <i>Phreatophytes</i>                           | <i>Evergreen shrubs</i>  | <i>Succulents</i>  |
|--|--|--|--|--|
| Life span                              | Mostly ephemerals;<br>some perennials  | Perennials                                     | Perennials   | Perennials   |
| Principal phenotypic<br>characteristic | No obvious<br>specialisation   | Long deep roots                                | Small and<br>specialised leaves,<br>or no leaves   | Succulent body,<br>usually without<br>leaves   |
| Photosynthetic<br>characteristics      | High photosyn-<br>thetic rate during<br>periods of water<br>availability (many<br>C <sub>4</sub> plants) | No obvious<br>photosynthetic<br>specialisation | Relatively low<br>photosynthesis<br>but can photo-<br>synthesise under<br>water stress<br>(mostly C <sub>3</sub> plants) | Very low photo-<br>synthetic rates<br>but can photo-<br>synthesise under<br>almost all<br>conditions (CAM<br>photosynthesis) |
| Water economy                          | No specialisation<br>to conserve water   | Tap underground<br>sources of water            | Specialised to<br>withstand water<br>stresses; high<br>resistance to water<br>loss                                       | Store water  |

Table (2.4) Major features of desert plants (Louw, op.cit., p38).

From their table, it is clear that such characteristics are deep root development and development of either small specialised leaves or a large succulent body without leaves. The orientation of leaves is also an important consideration, as it will determine the surface area exposed to light for photosynthesis as well as the heat load from solar radiation.

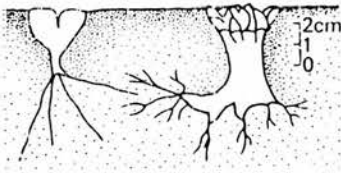
Surface projections and an irregularly shaped surface are important for reducing incidental radiation and also the heat load on a desert plant. As an example, the spines of "Opuntia" species reduce heat loads by increasing reflectivity and creating a boundary layer of air between the spines and the surface of the plant (Fig 2.41a). Spines are also involved in the protection of the plant against herbivores and in the dispersion of species. Cereus schottii is a good example of a highly irregular surface which scatters incidental radiation and reduces heat loading (Fig (2.41b)). There are also some succulent species which grow beneath the soil surface with only peculiar leaf tips appearing above the surface. These species are protected by the surrounding soil from excessive radiation (Fig (2.41c)).

In addition to leaf orientation and architecture of the plant's surface, the nature of the plant cuticle plays a very important role in determining the rate of water loss.

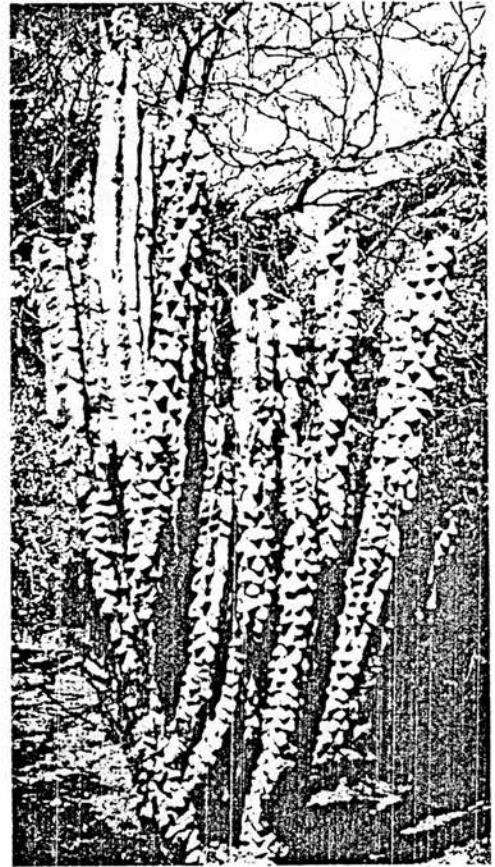
In the physiological adaptation, most organisms cannot tolerate temperatures much in excess of 42°C. The standard explanation given for this phenomenon is that tissue enzymes become denatured at high temperature and, as a result, important metabolic pathways cease to function. Tolerance of dehydration is also a physiological adaptation. Plants usually avoid dehydration whenever possible either by ephemerality or through development of adaptive morphology which protects them from desiccation.



a) Opuntia spp.



c) Lithops spp.



b) Cercus schottii spp.

Fig (2.45) Example of morphological adaptation (Louw, op.cit., p38).



Tolerance of desiccation in vertebrate animals is perhaps best exemplified by desert amphibians which can tolerate losses of 40-50 percent of body water.

Behavioural adaptation can be seen in different ways. Ostriches in typical desert habitats increase convective and radiant cooling by orientation, feather erection and wing drooping. Orientation of the long axis of the body in relation to incidental solar radiation is a fairly common form of thermoregulatory behaviour and is not confined to desert animals. Another example is the African ground squirrel. On hot, windless days, these animals flair and raise their tails above their backs, using them as portable sunshades as they forage for food on the surface.

In general, the adaptation of plants and animals depends on their individual shape and size. Most animals and plants in the desert must either be small enough to escape from the desert environment or large enough to be able to tolerate it. An understanding of the processes of the desert ecosystem (i.e. adaptation) will be helpful in finding a principle for design in the desert environment [73].

#### 2.7.2 The evolutionary ecology of the desert

##### **Diversity**

Species diversity increases with increasing species density and as a result of increased partitioning of the niches occupied. The number of species existing in any one habitat depends on historical as well as ecological factors. In extremely arid areas the large temporal and spatial variations of rainfall has a direct influence on species diversity; it causes patchiness in the pattern of primary production, which tends to increase species diversity. Patchy use of the desert by burrowing species may also contribute to species diversity through alteration of the substrate. For example, the burrowing activity of

gerbils and ground squirrels provides a suitable habitat for plant species otherwise excluded from undisturbed ground.

### **Stability**

Stability of an ecosystem is a somewhat elusive concept which is thought to depend on the diversity of the components:

Environmental stability + community stability = high diversity.

There are two aspects of the environment which may affect stability in desert areas. These two aspects are predictability and productivity.

### **Succession**

In an arid environment changes in species over an environmental gradient, particularly of moisture, are often very clearcut, while changes through time are not. The changes in vegetation through time may either be unidirectional and are then called a succession, or may be cyclic [74].

Succession continues until new species no longer alter the environmental gradient. The habitat may be changed by species occupying it; such changes may provide better living conditions for plants other than those which caused the habitat modification.

In a new site which has unfavourable conditions, only those few species highly tolerant of such adverse conditions can become established and undertake this ecesis.

Other individuals of the same species will continue to invade an environment already somewhat improved. Their fallen leaves and other decaying parts will initiate a small deposit of organic matter; their roots will somewhat modify the penetrability and the structure of the soil, which, from a homogenous state, will pass to a more heterogenous one.

Then will come plants of other species with slightly higher requirements. Thereafter, species with higher and higher requirements

will come in, while those which are already established will take refuge in the least modified parts of the ground, finally to be eliminated altogether as conditions improve.

Such progressive differentiation of an ecosystem is accompanied by a gradual buffering of climate. Of course, the macroclimate (the amount of light, heat, rain and wind in the atmosphere immediately above) remains the same throughout, but the degree to which its rigor is tempered locally will be quite different. The bare ground of the pioneer stage undergoes the full range of variation in temperature and evaporation; it cannot check radiation nor the mechanical affect of rain and wind. Progressively, the strength of these elements is attenuated, and within the plant community a microclimate prevails which is distinct from the macroclimate [75].

There are some examples of succession which could be considered as progressive vegetation changes. Sand dunes could be fixed by applying the same process of dune succession with a little human interference; some species could grow on dunes with the same speed as the dunes build up. Dune succession phenomena could be characterised by five stages and each stage is characterised by one or more species. The Ammophila arenaria colonise the area in the first and second stages. The third stage is associated with Cruccanella maritina, which becomes even more important in the fourth stage. In the last stage, the number of species may be rich, numbering up to 39 kinds [76].

The succession phenomena could be useful for improving soil quality. The salt-marsh succession, by using plants from high salinity to low, would reduce the salinity in the soil.

The effect of succession phenomena, and especially of occupancy by plant cover, can be summarised as follows:-

It has an effect upon soil by moderation of drainage. It effects

the vegetation by increasing coverage and biomass, progressive utilisation of layers above and below the soil line and progressive increase of shade. It also has effects upon microclimate in the form of attenuation of temperature extremes, reduction of temperature and humidity fluctuations and decrease of evaporation, at least near the soil surface.

### 2.7.3 Man's effect

The ecological balance of dry land is continually responding to, and evolving with changes in climate, soil and water and plant and animal populations. But above all man is rapidly changing the land for his own ends [78]. The Middle East has been popularly described as a "Cradle of Civilisation" because of its ancient settlement by man - settlement which inevitably implies interference with the balance of nature. Much of the wilderness and desert areas which now exist have been man-made. One should never underestimate the destructive potential of man in the Egyptian desert during the last two thousand years, especially the losses due to grazing and the felling of timber. The north coast of Egypt was one of the greatest farming areas during the Roman Empire. "Egypt once possessed considerable forest resources in the Eastern Desert and in the Sinai. The forests survived down to the twelfth century and were protected by a complicated system of forest laws. These were not enforced, the trees were felled and have never been reestablished." [79]

In this century, there is much evidence in Egypt to prove that a great deal of productive land has been changed into non-productive land. One example is Mareot's land. The whole district, which in ancient time was famous for its fertility, is, in the present day, for the most part barren wasteland.

Grazing is also a considerable problem in many arid zones. In

parts of northern Egypt and Sinai, a forest can be developed simply by erecting a fence to keep animals out. The desert areas serve as a range for sheep, goats, donkeys and camels. Since the plant cover is very sparse, grazing has a very pronounced affect. Therefore, the best forage plants, which include especially the grasses, have often completely disappeared. The few remaining plants are usually those that are not taken during grazing, i.e. they are either poisonous or unpalatable, or have rough hairs or thorns.

In addition, nomads have had an important influence on the vegetation up to the present day as the woody plants are used as fuel by them.

Complete protection from grazing is not always required. A SEMDENE project has proved that in arid lands with a long history of overgrazing, complete protection of ecosystems for extended periods might lead to further deterioration of their productivity and perhaps controlled grazing and low cutting would be a better management policy [80].

Wherever man attempts to interfere with the balance of nature to serve his own ends, he brings its finely integrated systems into disarray [81]. The construction of the High Dam south of Aswan has been the greatest interference by man against nature. The first damage done by this project was the irreparable flooding of the whole of Nubia with its villages and temples. In 1968 the dam put a final end to the annual natural phenomenon of the Nile flood and its precious cargo of mud, which has meant loss of fertility in the soil of the Nile Valley. Since 1970, one million tonnes of nitrogen and 250000 tonnes of phosphate have been applied to the fields of Egypt's small agricultural area to make up for the natural annual topdressing of flood silt. This has weakened the soil and reduced the wildlife [82].

There can therefore be little doubt that the regional environment will be substantially affected by the new regional development strategy for the New Towns. These changes require skillful design and management of developments to exploit the opportunities of water, climate and topography in order to create an attractive living environment and to avoid destruction of the natural environment.

#### 2.7.4 Desert landscape characteristics

Finally, after the examination of the desert ecosystem, the term "desert" should be clarified.

The designation "desert" depends very much upon an implicit comparison with the observer's background. "The Egyptian who is familiar with the most extreme desert in the world does not consider the coastal strip of his community as a part of the desert, in spite of the fact that this area is much drier and more poorly vegetated than Sonoran Desert" [83].

To the layman, a desert is merely a hot, dry area of the earth's surface where the vegetation is usually stunted, often bizarre in form and either absent or patchily distributed. This concept could serve us quite well, but an examination of some contradictions is also justified [84].

In fact, deserts do not differ basically from other terrestrial ecosystems inhabited by man, but limited resources and a harsh climate impose a certain discipline and respect for nature. Also, the limited resources have never been able to support a dense population and, although life may be difficult, it also has a tranquil and mystical quality. It is not surprising therefore to learn that several of the major religions of the world have emerged from arid and semi-arid regions.

The desert landscape is very variable and includes all the common





Fig (2.46) Typical landscape features of the Egyptian desert.

- Plain sandy desert (Western Desert "Quatara").
- Sand dune hills (Easter Desert, Cairo-Ismalia road).
- Steep slope of Wadi Hoff (Cairo).
- Wadi area (Cairo-Suez road).

(Sketch by the author).

landscape elements: mountains, valleys, plateaux and plains. The mountains are usually bare and angular, rock outcrops are very common and it is rare to find smooth, rounded surfaces. The plateaux and plains are almost completely flat, and their surfaces vary from pure sand to rough stone. Soils of varying thickness are found. Fig (2.45) shows some typical desert landscape in the Egyptian desert.

At the same time, there are a number of other characteristics typical of the desert landscape. Vegetation is always scarce, sometimes completely absent, and a complete vegetation cover hardly ever develops except after rain. This could be one of the factors responsible for the great similarity in landscape of all arid regions.

### **Summary**

A clear understanding of the Egyptian Desert ecosystem is an essential step for any new development and care must be taken to avoid disturbing this ecosystem as little as possible. At the same time, a good distribution of land use pattern and good management of natural resources will lead to good planning for the E.N.T. policy.

The survival of desert plants and animals in the harsh desert environment is remarkable evidence. An understanding of the processes of the desert ecosystem (for example adaptation and succession) will be helpful for any design in a desert environment.

The desert landscape is very variable and includes all the common landscape elements like any area elsewhere. However, the Egyptian desert development should be resolved within its own socio-economic framework and with the resources available to it, taking into consideration the preservation of its ecosystem and its environment.

Finally, the ecology cannot easily be dealt with without considering the influence of man on every ecosystem.

## 2.8 HUMAN SOCIAL FACTORS

Social aspects play an essential part in the overall strategy of any development. "Kassler suggests that good planning and design will be the product of a process which respects both the nature of man and the nature of nature" [85].

An understanding of the behaviour and the social aspects of the Egyptian will be helpful in solving the landscape design problems of New Town development.

### 2.8.1 Behaviour

Behaviour is the result of a complex interaction between the physical environment that surrounds and affects the individual and the inner condition of the individual, and which has two parts: physiological and psychological [86].

The physical factors have been described in the previous sections, but the existing environmental conditions which could affect the behaviour of Egyptians can be summarised as follows: Egypt is an area of extremes and sharp contrasts - the lush Nile Valley and the surrounding desert, strong sunlight and deep shadows, burning hot days and cool nights, dry months and wet periods, steep hills and flat land. Skies are blue and man-made colours are primary. It should be noted that most Egyptians have traditionally lived in modest conditions close to the Nile.

The human physiological needs have been achieved through homeostasis [87]. The Egyptian's historical association with the Nile Valley and the desert environment is well known. Man has proved to be an adaptable being.

The psychological factors are more difficult to define than the physical and physiological factors and relate to the form of the environment. Human psychological needs and perception of the environment

differ according to a multitude of variables, including age, social class, cultural background, past experience, motives and daily routine of the individual. There are many factors which are characteristic of the Egyptian's behaviour, but there are certain basic factors which have a great influence on any development. These are income, education, religion, culture and traditions.

### **Income**

Egypt is in the middle range of developing countries. Under very optimistic assumptions of economic growth, over half the families in Egypt will earn less than £E50 a month by the year 1990.

There are fewer regional or rural-urban disparities in Egyptian living standards than in many developing countries. Rural per-capita consumption is probably about two-thirds of that in the towns. Overall, however, people in the country are worse off than those in urban areas. The Egyptian population is basically clothed and adequately fed according to the Egyptian standards.

In general, most families do not have enough private savings to invest in large projects and most of the large investments are made by the government [88]. The great majority of Egyptians could be considered as low income people. This is reflected in their private property. For example, in Egypt the rate of car ownership is very low (the Cairo average for car owners is 13/1000 persons) if compared with advanced nations or other developing countries [89]. So the design of a new town in Egypt must depend on the human scale, and distances within the neighbourhoods should be reasonable for walking. At the same time, housing standards in the new settlements should match the ability of the low income classes as they represent a majority of the people. This means low cost housing and low cost landscaping.

## **Education**

Most developing countries suffer from a high proportion of illiteracy. In Egypt the situation is gradually improving. Fig (2.47) shows illiteracy trends from the censuses of 1937-1976 by sex, 10 years and over.

In spite of the fact that Egypt has a high percentage of individuals in higher education in comparison with other countries, there is no public awareness of environmental factors even among those who have had higher education. It may be said that environmental education is more than the biology lessons taught in the universities. For education to be an effective instrument for social and economic development, it must provide man with knowledge and a thorough understanding of the environment in which he lives and with the means for bridging the gap between this knowledge and its application [90]. Unfortunately, there is no complete education for landscape architects in Egyptian universities. This has a great effect on understanding the concern with the landscape [91].

## **Religion**

Religion may be considered as one of the main influences upon Egyptian behaviour. Islam is the official religion of Egypt and the religion of over 95% of the population [92]. Strength of religious belief influences behaviour. While some groups preserve the Islamic pattern of life and see it as a solution to many social, economic and political problems, there are others who think that religion has nothing to offer except to prescribe the way of worshipping. Between these two extremes lie those groups who have been partially influenced by westernization, but retain Muslim beliefs [93].

Nowadays, the Islamic movement is growing again in every stratum of society demanding the application of Islam as a way of life [94]. This

increase reflects the growing desire amongst a considerable proportion of the Egyptian people to return to a way of life governed by Islam. Any development should respect these desires and people's needs.

### **Tradition and culture**

Various cultures and civilizations have influenced Egypt (Note 1.2), but Islam remains the dominant cultural force [95]. Islam has produced an integrated pattern of religion, life style and urban planning which is determined by the environmental conditions which prevail in the region. It is clear that Islamic architecture drew on sources furnished by other civilizations extant in the regions newly converted to Islam. Quickly, however, Islamic architecture acquired its own character, which is primarily based on the teachings of Islam: the Holy Quran and the Traditions of Prophet Mohammed (p.b.v.b.)

It is a well documented observation that Islamic urbanisation is characterised by high density, low rise developments, with an introverted concept on both the urban (city) scale and the local building scale (courtyard house). This concept has led to privacy, climatic advantages and lively, positive urban spaces. (The traditional urban area will be examined in more detail in Chapter 4.). In fact, it is an admirable concept which suits both the people and the place. Why then has this traditional adaptive mode of urban form been sacrificed for an alien form?

The reason is that most contemporary architecture is not fundamentally Islamic in that it does not suit Muslim needs. Rather, it has been borrowed from elsewhere and developed by Muslims and is "Muslim" rather than "Islamic". It can therefore more properly be called "international architecture". Such a trend is not new. It was first observed at the beginning of the 20th century, when the architect was encouraged to pay no attention to Islamic architecture and to admire Western



architecture [96].

Such a period must necessarily be a period of transition involving fundamental transformations from the traditional Islamic concept to the more modern one. This was described by Abdelhalim as follows "Historically, in Cairo the nineteen twenties were a decisive period witnessing the physical completion (planning and architectural) of institutions on Western lines, as initiated by Mohammed Ali and planned under Khedive Ismail. This was, I believe, a real turning point in Egyptian public life, exceeding in importance the establishment of the administrative, military and even intellectual institutions. Architecture and building in Egypt had always been a framework for legitimacy and a vital process for the embodiment and formulation of a balance of forces". He added, since then the architecture and urbanism of Cairo have been an embodiment of the conflict between the two trends: the acquired, which is Western in its origin, secular in its thinking, materialistic in its economy and cumulative in its laws; and the inherited, which is Islamic in origin, religious in ideology, social in economy and regenerative in its laws. As a result, a rift in the Islamic identity of Egypt began during this period [97]. Fig (2.48) shows the conflict between the two trends.

Physical disfunction became evident as new patterns of urban expansion followed Western design standards which were totally unrelated to the traditional Islamic urban fabric of Egyptian towns and in particular of Cairo, which is organized around shiakha (quarter), hara (neighbourhood) and suq (centre) (see Chapter 4 for a more detailed definition of these terms).

The present-day transformation of Egyptian architecture and urban form is proceeding with the new towns programme, in the same structural circumstances that witnessed the early transformations and changes which

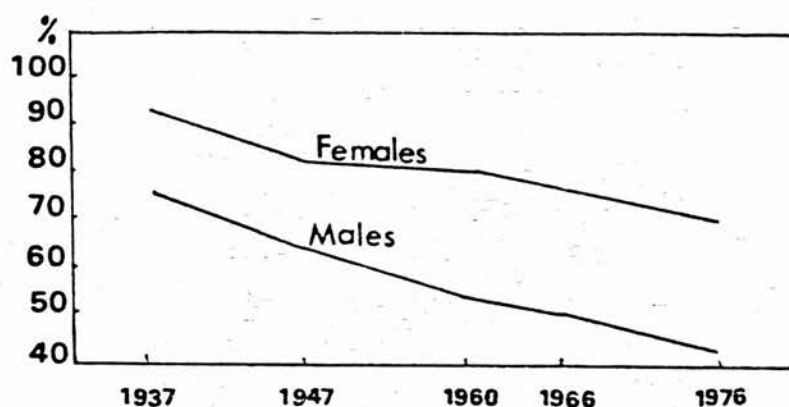
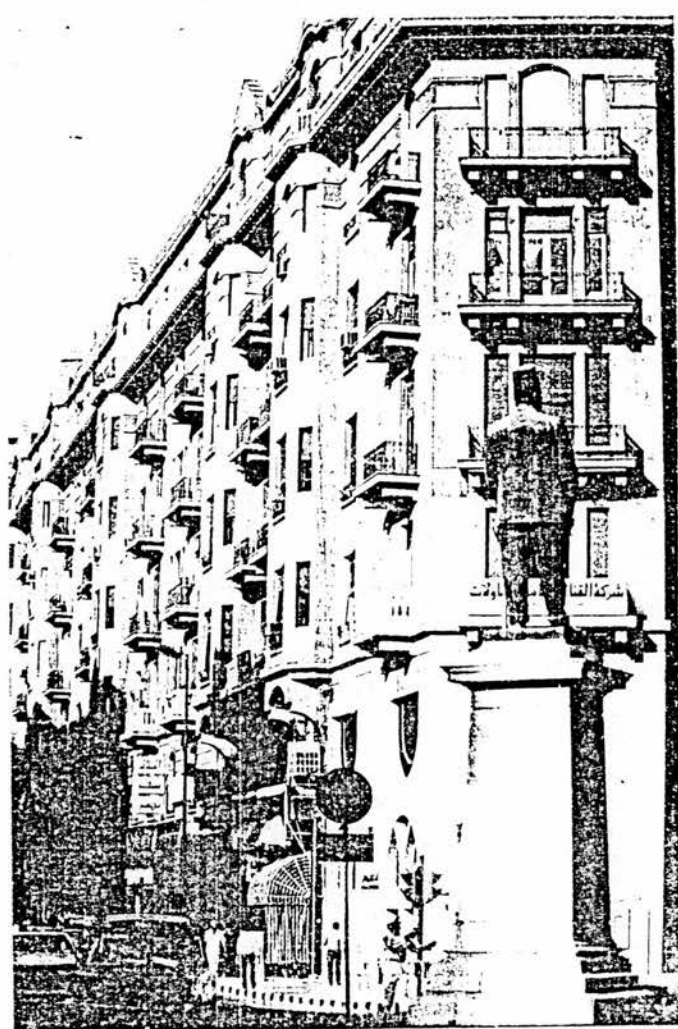


Fig (2.47) Illiteracy trends in Egypt (Attia, op.cit., p67).



a Building in Sulaiman Pasha Square, part of Khedive Ismail's plan for Cairo.



b The main streets of old Cairo served for a number of commercial and community activities.

Fig (2.48) The conflict between two trends, the acquired and the inherited (a - Ibrahim, "Cairo - a Sociological Profile, b - Lewcock, "Conservation in Islamic Cairo", The Aga Khan Award for Architecture, 1985, p26,49).

introduced the acquired Western trends. The admiration of other cultures by politicians and planners, based on personal taste and judgement, has a great influence on events. External factors such as aid programmes also have considerable influence on this transition in the urban mode. The involvement of professionals from developed countries is inevitable with the aid packages. Aid is not politically neutral - governments and international agencies have policies which they try to implement through their aid programmes. These policies may or may not be in tune with the policies of the recipient country. Nor is aid neutral in a technical sense; aid agencies are staffed by technicians and administrators who have their own ideas and their own personal ambitions [98].

#### 2.8.2 The characteristics of the residents of a typical new community

Most of the people who move into new towns have come from crowded communities with an extensive range of opportunities but limited on a per capita basis. For example, parks are often available in big cities, but the per capita area of open space is inadequate. They may have lived in the Cairo conurbation, with a compact residential density averaging 510 inhabitants/hectare (in some sectors reaching 1581 p/h) [99], and this is reflected in the behaviour of the people. Carl Schieren describes the people in Cairo, saying "Life is harder in Cairo now. It is more difficult for everybody. It was a relaxed place with people sitting, drinking, talking, walking in the streets. Now everyone seems to be in a hurry, even if they are not doing anything" [100]. In spite of this fact, these people still have their warm social life.

In some of the new postwar communities around London, at least some of the inhabitants had grown up in the warm closeness of the East End of London and they found that the physical form of the new towns prevented social interactions of the type to which they had been accustomed [101];

the same situation can be found in most of the E.N.T.

A naturally-grown community normally consists of a certain number of members of different ages and sex, and a variety of families of different sizes or number of members, with different professions, habits, culture and background. The population of a new settlement consists mostly of young people looking for a better life and opportunities to satisfy their venturesome urges. On the other hand, older people, for the most part, do not wish to leave their traditional living place.

The Egyptian population is still young, the proportion of children below 12 years being over than 20%. Egyptian society is male dominated despite the upward trend in women's education in urban areas. Agricultural labour is the occupation of more than half the population [102] but most of the new towns have an industrial function. A rough estimate of the future composition of the labour force of 10th of Ramadan New City, based on different indicators, may look as follows [103]:

5- 7% - high level (managerial and scientific)

25-30% - middle level (office and trade)

45-55% - workers (skilled and unskilled)

2- 5% - farmers

5% - unemployed

### 2.8.3 The Egyptian attitudes to nature

"Egypt consists only of wasteland and farmland. There is no wild or semi-wild vegetation of any significance to the people - although there are in fact some significant areas of salt-marsh and desert scrub. The people are very alive to scenic attractions, e.g. the Nile (Fig (2.49)), the coast, public parks, archaeological remains, but they do not like wild places" [104]. E. Zeub, who was a member of a study team visiting Egypt to review initial efforts towards the development of a

national park/nature preserve area, says "It appears that many Egyptians have learned to dislike their wilderness" [105]. The Egyptian attitudes towards arid lands must be reversed.

Water fronts are always highly valued by the Egyptian. They are known as "corniches" and have been laid out in all the big coastal cities and the cities alongside the River Nile. People are used to sitting and strolling in these areas on summer nights.

As an agricultural nation, Egyptians associate exercise with work and not with recreation. Also the agricultural landscape (Fig 2.50) which dominates the Nile Valley is created from environmental, social and economic necessity. Therefore, the Egyptian views a plot of land as a food resource which should be harvested, rather than as ground for ornamental plants. This may explain the attitude of Egyptian children in cutting roses and small trees or shrubs. Despite this, cultivated ornamental plants are noticeable beside roads, public buildings, small shops, public footpaths and on balconies.

The Egyptian is not used to a spacious common open area outside his dwelling in the traditional towns in the Nile Valley. The courtyard houses provided his need for open space and the large open space which is familiar to the Egyptian outside the dwelling is in the form of green fields in the surrounding countryside. To the town dweller, however, the countryside is a place filled with dirt and polluted water. This is the opposite of the English view of town and country.

People use the outdoor space in the city in different ways: sitting at cafes, visiting market stalls or street sellers, sitting on benches, watching fountains, walking along the corniche, playing ball games like organised football, and praying. They prefer to sit in shaded areas and they will only sit in the sun if they are cold. Vegetation is desirable and loved and treasured.





Fig (2.49) The Nile at Aswan (photo by the author).



Fig (2.50) Landscape of agricultural land in the Nile Valley (productive landscape—sugar cane crop) (photo by the author).



## **Summary**

The design of any part of the environment - be it building or open space, should be formed through an understanding of and a sensitivity to the complexity of the human personality, it is the people, not buildings, that make the place.

The behaviour of the Egyptian is a result of the interaction of many factors. The sharp contrast between the lush Nile Valley and the surrounding desert has had a great effect on Egyptian attitudes over more than 6000 years.

The Islamic religion is one of the main factors which has formed Egyptian behaviour. Islam has produced an integrated pattern of religion, life style and urban planning. Privacy is an overriding demand for Islamic social life. There is clear conflict between the acquired architecture and urban form (Western) and the inherited architecture and urban form (traditional).

The Egyptian attitude to wild or semi-wild land is uninformed. The dislike of the desert environment is inherited from 6000 years of tradition. There is a great need for environmental knowledge and its application. Landscape design results from a combination of cultural, physical and socio-economic factors.

## **2.9 AN EXAMPLE OF A TYPICAL VERNACULAR DESERT LANDSCAPE TYPE**

### **2.9.1 Introduction**

The following example is a typical vernacular desert landscape which naturally takes into consideration the previously mentioned regional landscape factors. "No important event in education occurs without roots in time past" [106]. In planning the E.N.T., an analysis of the traditional principles of desert settlements and building forms provides the necessary link between historic settlement patterns and the requirements of the modern new town. This part is an attempt to

identify the vernacular forms of natural or agricultural landscapes and urban landscapes that were created from environmental, social or economic necessities. Any project based on such research should, wherever possible, attempt to discover the local landscape characteristics which have been lost in new desert settlements over the years, in order to seek a valid basis for any new development. It is an essential stage to test the traditional desert environment, which will help the evaluation of the E.N.T. At the same time, this part is an actual and good example of the interaction between the ecological factors which have been examined in this chapter.

One of the Oases where the earliest desert settlements were formed in Egypt will be examined briefly to pick out the main landscape characteristics of this traditional settlement. It is an essential stage which should help in the evaluation of the new desert settlement. It should also be noted that the task here is not to provide a comparison between the old and new desert settlement (this will be done in Chapter 4). Conditions in Oases are different especially with regard to population, scale and possibly also physical conditions (such as hyperarid and arid). However the design response principle for adaptation to a desert environment is the same.

Hassan Fathy observed that "The environmental conditions in the desert have not changed today from what they were yesterday, and we have historical examples in the Western Desert of Egypt from all periods, the Pharonic, the Early Christian, the Islamic and the modern, from which most valuable information could be drawn in architecture, structures, planning, climatology . . . etc." [107].

The Siwa Oasis is an outstanding illustration of the truth of Fathy's observations. The existing settlement patterns here and the individual buildings have been influenced by the prevailing climate in a

centuries-old process of adaptation. This adaptation can be seen in the old village of Siwa.

### **Siwa Oasis**

The depression in which Siwa Oasis lies is irregularly shaped and generally elongated in an east-west direction. It is the farthest depression from the Nile Valley and is approximately 50 km long and covers 300 sq km (Fig (2.51)). The irrigated area within the depression is 90 sq km and parts of it are below sea level. The southern border of the Siwa Oasis blends with the northern boundary of one of the largest dune fields of the Sahara, the Great Sand Sea.

The ancient city of Siwa was originally at Aghurm where the remains of the two principal temples of the Oasis still stand dating from the fourth century BC (Fig (2.52)). The new settlement is the present-day town of Siwa, founded according to Siwan Manuscripts in the year 500 A.H. (A.D. 1203).

According to the census of 1966, the total population of Siwa Oasis was 5109 and this had risen dramatically to 13000 by 1978. Siwa is still the most interesting of all the oases, not only for its place in history, but because of its beauty and its people's unique way of life.

The climate in the desert is severe with great changes in air temperature. In summer, air temperature in the shade reaches 48°C in Karga Oasis. Great care has to be taken in design to achieve thermal comfort using economical, natural means. Solar radiation and the reflectivity of the white sand are the major causes of physical discomfort in the desert oasis [108].

#### **2.9.2 Landscape characteristics of the traditional urban form**

In spite of the ruinous condition of the ancient town of Siwa, it still has an attractive character. It commands the landscape in this part of the Oases, and its ancient minarets with their typical archi-

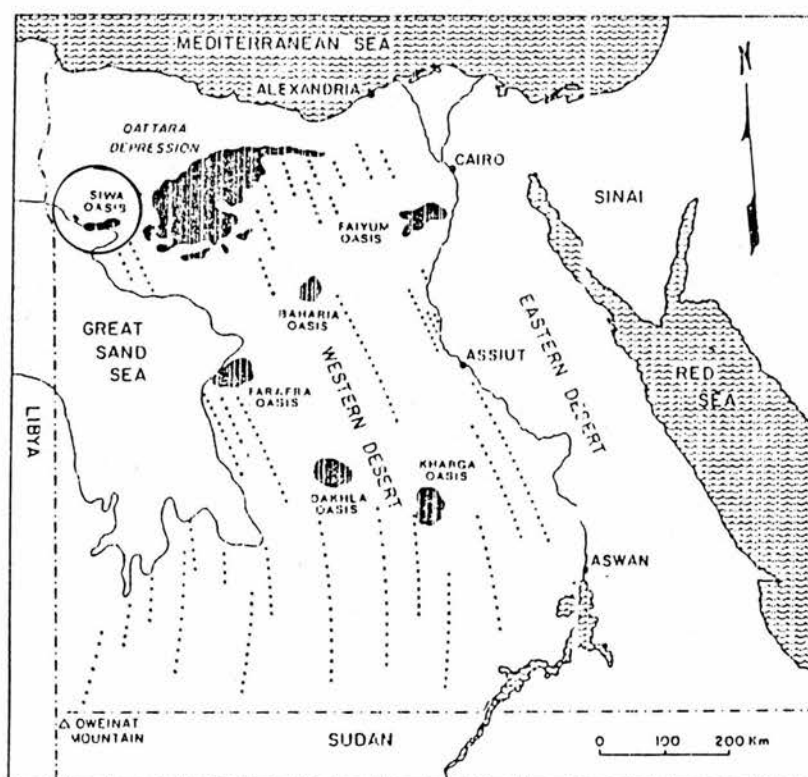


Fig (2.51) Map of Egypt shows the location of the oases (Bishay, op. cit., p70).

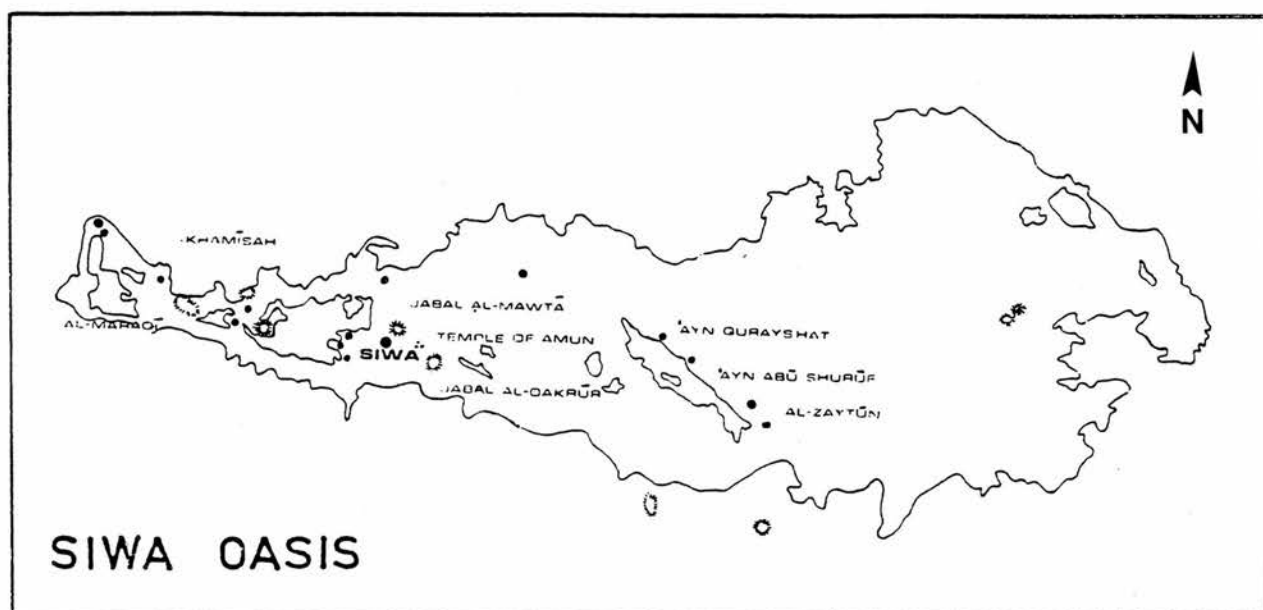


Fig (2.52) Map of Siwa (Fakhny, A., "The oases of Egypt", Cairo, 1973, p16).

tectural shapes, add to the beauty of the scene (Fig (2.53)).

Many houses which were built of sun-dried mud brick on the tops of the hills of the old city have collapsed as a result of unusually heavy rain and lack of maintenance. The most common type of roof for the remaining housing is a flat roof made of planed palm trunk and a thick layer of mud plaster, a building form which recurs throughout the arid regions of Africa. The walls are made of mud-brick and stone materials which are available within the area and which are in great harmony with the existing landscape. There are few windows and they are quite irregularly distributed on the facade (Fig (2.54)). The housing seems to have grown with the occupying family's needs by gradual extension either upwards or horizontally. Some families have continued to live in the houses at the lower edge of the ancient town (Fig (2.55)). Nowadays, new modern buildings constructed of materials which spoil the landscape have been built on the edges of the old town.

### **Planning concept**

The compact planning concept with its adaptation to the desert environment dominates the Oasis of Siwa and all the traditional desert settlements in North Africa and the Middle East. The need to control heat, dust and sand in hot dry area where water is in short supply and vegetation hard to grow, is well understood by people in these traditional desert settlements.

A research study made by the "Environmental Studies Centre" of Cairo University has indicated that the planning pattern has been clearly influenced by the climatic factor; the more severe the climate the more important it becomes. In hot dry areas in Egypt, where the traditional compact planning concept dominates, it was found that the mass of the built-up area reaches 60% in this traditional pattern, whereas it does not exceed 30-32% in the coastal cities. At the same



Fig (2.53) The ruinous part of the old town with its ancient minarets (photo by the author).

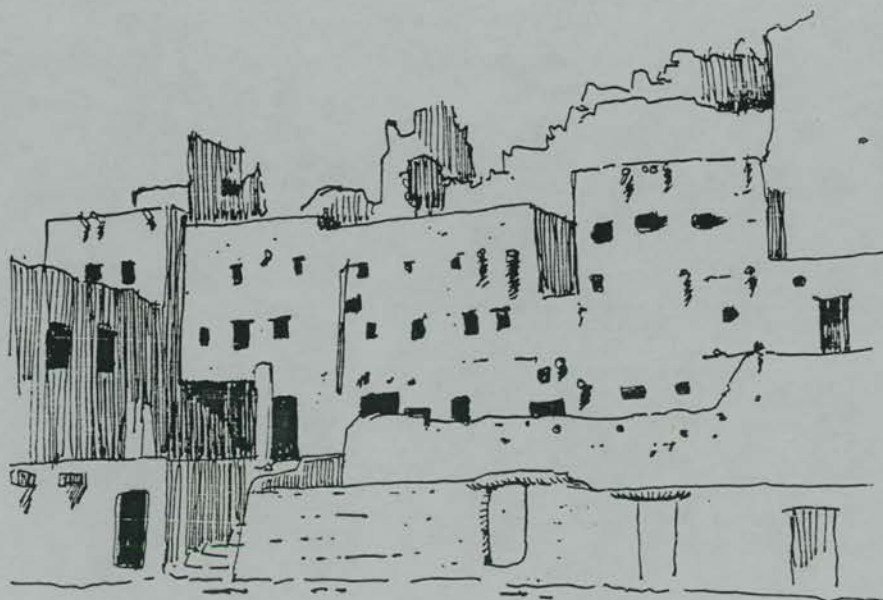


Fig (2.54) The traditional houses with their small windows which are quite irregularly distributed on the facade (sketch by the author).





Fig (2.55) New houses at the foot of the old town (photo by the author).



Fig (2.56) Siwa Oasis. The old town is integrated with the surrounding palm grove (sketch by the author).

time, the study indicated also that climatic factors have less effect on the planning pattern in the Nile Valley cities (in comparison to desert settlements) than other factors, such as geographic, economic and functional factors [109].

The old town of Siwa presents a very compact planning pattern (Fig (2.56)). The town looks as one mass, orientated inwards, and it provides its own microclimate away from the harsh surrounding desert climate. The main streets are narrow, meandering and shaded, surrounded by a close mass of buildings, which are penetrated by some dead-end streets (cul-de-sacs) (Fig (2.57)). The buildings around the streets have been grouped closely together to give as much shade as possible to each other and in some areas the streets are completely covered by buildings or wooden roofs (Fig (2.58)). This lessens the tunnelling effect which causes increased wind velocity and dust movement. The street open spaces and buildings are human in scale and were organised in such a manner before the need to consider motor vehicle access.

The modification of microclimate has also been achieved by the size of the houses in the Oasis planning concept.

People have learned to close their houses to the outside and open them inwards onto internal courtyards called "Hosh" (Fig (2.59)).

"As evening advances the warm air of the courtyard which has been heated directly by the sun and indirectly by the warm building, rises and is gradually replaced by the already cooled night air from above. This cool air accumulates in the courtyard in laminar layers and then seeps into the surrounding rooms cooling them.

In the morning, the air of the surrounding rooms (insulated by the roof) heats slowly and remains cool until late in the day when the sun shines directly into the courtyard. The warm



Fig (2.57) Part of the urban mass plan "Moult" (Sameh, H., Planning & Architectural Criteria with respect to Climatic Conditions, p50).



Fig (2.58) Covered street (sketch by the author).

wind passing above the house during the day does not enter the courtyards, merely creates eddies inside unless baffles have been installed to deflect the air flow. In this way, the courtyard serves as a reservoir of coolness" [110].

Controlling microclimate depends also on construction elements: walls, floors, ceilings and other surrounding surfaces, all of which have an effect on human comfort. The material plays a great part here. Mud and stone, with their unique thermodynamic qualities absorbing and releasing heat very gradually thus keeping the interior cool by day and warm by night, have been used widely. Fig (2.60) shows a comparison of the indoor and outdoor air temperature fluctuations of both a mud-brick vault and a concrete one within a twenty four-hour period.

The interiors of buildings are protected from the low level dust which swirls within the settlement by almost blank walls with very small openings. These small openings also provide protection from the sky glare outside.

In general, the old town's introspective walled design has evolved for complex and highly motivated reasons. The desert is hot, barren and hostile, the town safe and shady. These traditional principles should be followed in any desert development.

In spite of the fact that the traditional layout may not have been designed to accommodate motor traffic, solutions to this problem could be found. "One alternative for example is to encircle the residential quarter with a ring road for cars, with access cul-de-sacs, streets branching off into the interior as suggested by the Radburn Planning. Another solution is the Dynopolis concept launched by Doxiadis, which assumes that the characteristic traditional layout can be preserved within the quarter" [101]. New successful examples have been constructed, applying the traditional concept, such as New Gournia by H. Fathy

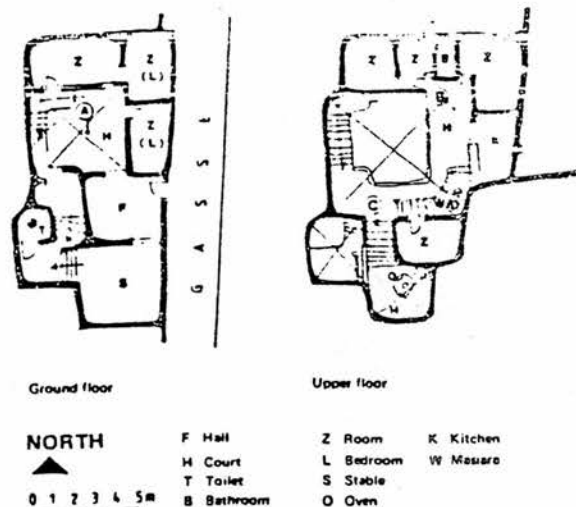


Fig (2.59) The plans of one of the oases's houses (Götz, L., "Integration of Climate in Planning and Building illustrated in a Case of Extreme Climatic Conditions", Elevier Sequoia, Netherlands, 1986, p57).

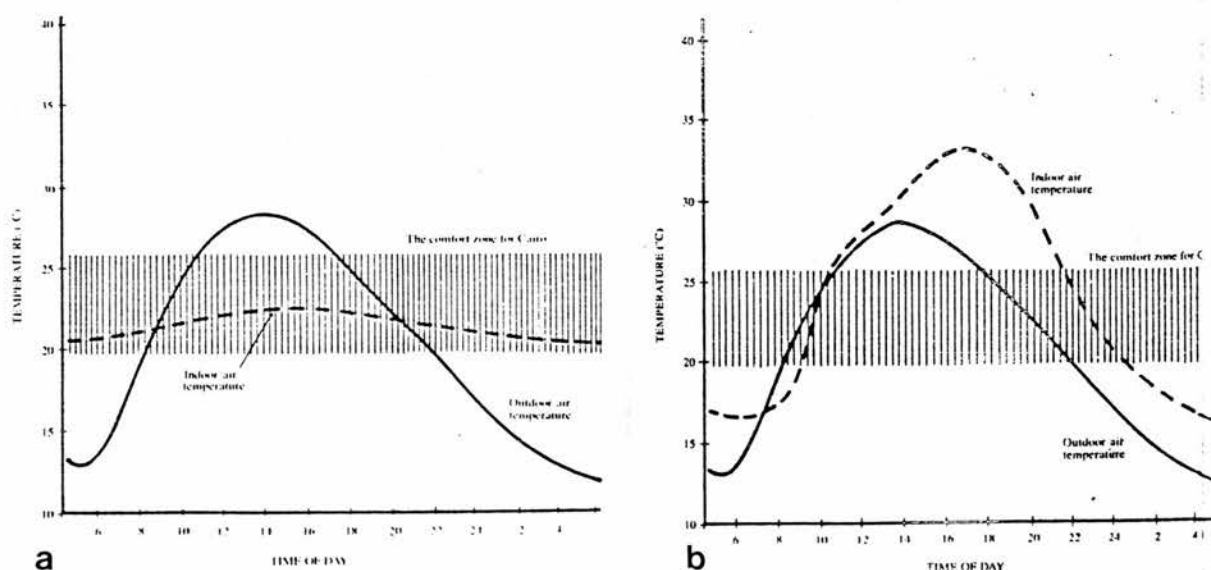


Fig (2.60) Comparison of indoor and outdoor air-temperature fluctuations within a 24-hour period for the mud-brick (a) and concrete dome and vault (b) (Fathy, H., "Vernacular Architecture", 1986, p79).



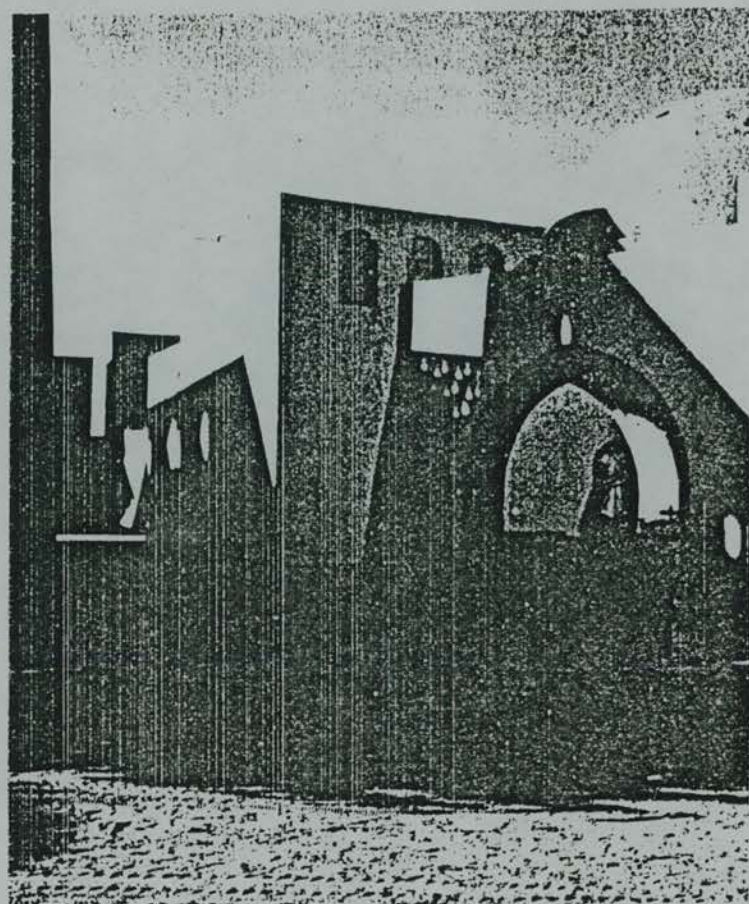


Fig (2.61) New Gournia (Ibid, p70,71).



Fig (2.62) Part of the palm groves of Siwa comes out from the limestone plateau (photo by the author).



(Fig (2.61)).

### 2.8.3 Landscape characteristics of Siwa Oasis

On leaving the coast of the Mediterranean, travelling to Siwa, no trees can be observed, except for some small green shrubs at the side of the road within the first 50 or 60 kilometers, this being the extent of a typical Mediterranean rain belt. However, after climbing the plateau approximately 70 kilometers from the shore line, there is nothing but barren desert until one descends the escarpment of Siwa with its palm groves (Fig (2.62)).

The palm groves are integrated into the traditional urban form of the old town of Siwa, forming an admirable landscape (Fig (2.56) above) as well as providing a natural protection for the urban form from the harsh surrounding desert environment (Fig 2.63)).

The cultivated land in Siwa amounts to 1300 feddans, 1000 of which are "Bostan" gardens with the remainder being used for crop cultivation [112]. The Bostan "garden" is always cultivated with perennial fruit trees (i.e. palm, olive) and the crop land is cultivated at different times of the year.

The original vegetation of the Oases consisted of Doum-palm, Acacia albiala and other wattle species [113]. Today, the original vegetation has been entirely replaced by date palms and other cultivated plants. The main reason for this could be the economic importance of palm trees. Wherever palm trees are found, they are intimately connected with Oasis landscapes. There are about 240,000 palm trees in Siwa. The palm tree is the tree for which the Siwan cares more than any other. The Siwan garden with its date palm trees has played an important role in the life of the Siwan people. They provide not only a valuable construction material but also protection against climate, heat, glare, wind force, dust and soil erosion. The date is the main trading product. The

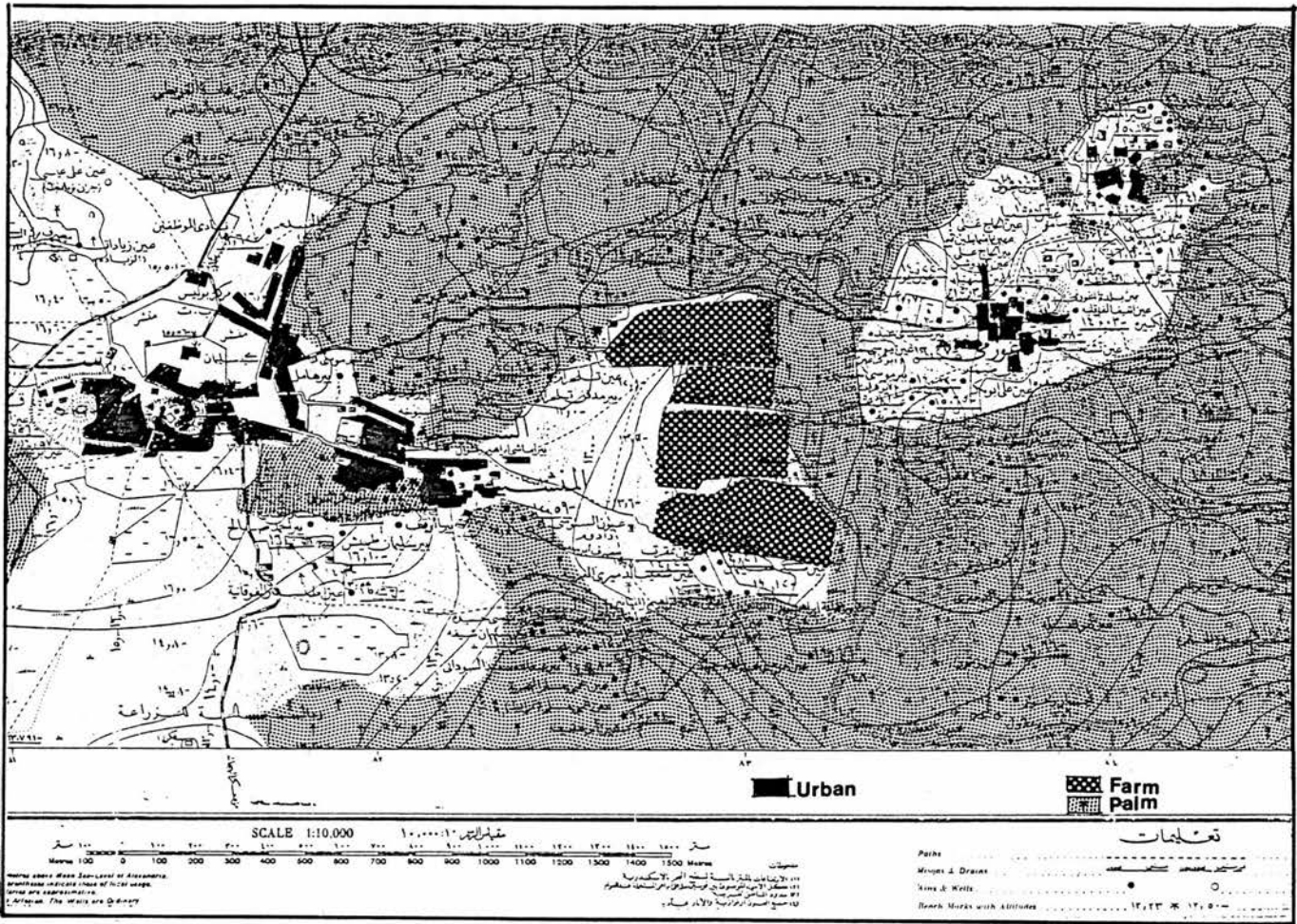


Fig (2.63) Map of Siwa shows the integration between building and green area which provided a natural protection against the harsh desert climate (Egyptian Survey Department, Cairo).

greenery of the palm trees provided a beautiful contrast with the colour of the site and buildings (Fig (2.62) above). The palm trees supported smaller fruit trees and vegetables beneath.

The olive is the second most important tree. There are about 30,000 trees in Siwa, some of them very old [114]. The microclimatic and soil conditions which develop under a mature stand of palms and olive trees add invaluable diversity to the ecosystem of the arid land. Other species are to be found in the Oasis, such as citrus, vines, apricots, almonds and figs.

There are some 281 springs in Siwa [115] and these springs can be seen in the midst of the Siwans' gardens (Bostan) as artesian wells. Some of them are natural and some started by merely digging a few meters down into the surface soil. They are generally surrounded by a circular stone wall, but the green moss and the air bubbles which emerge from natural fissures in the rock influence the beauty of the place, especially when the reflection of sunlight and the palm trees appears in deep green water (Fig (2.64)). Moving water from the springs gives a sense of life to the place. Running water in the shade is a gratifying thing in such a hot, arid climate and the Siwan people, like many people in arid areas, love to relax beside the springs in the shaded areas which have been designed specifically for sitting (Fig 2.65).

Siwa's greatest problem at the moment is not a scarcity of water from its springs; rather it is too much water with inadequate drainage. This has caused a rising water level, which damages the cultivated areas. Water from many flowing springs is unused and drains into salt lakes and the rising water level affects thousands of cultivable feddans, turning them into waste land. T. Larsen says "Siwa would still be green without human intervention, but not with crops, which need more water" [116].





Fig (2.64) One of the springs surrounded by a circular stone wall (photo by the author).

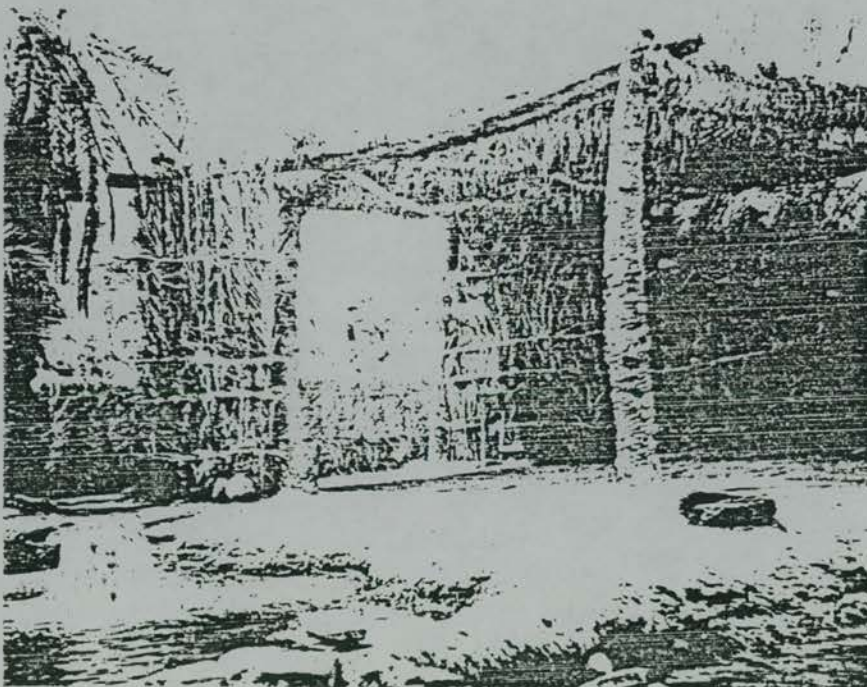


Fig (2.65) A shed at the side of Ayn (spring) Tzgzin (Fakhny, op.cit., p40).

In general, the Siwan gardens ("Bostan") have a special characteristic. They are always surrounded by fences, the lower part of the fence being made of mud, while the upper part is constructed of palm ribs (Fig 2.66). These fences ensure a good protection against hot, dusty winds and keep goats out of the gardens. It is very common for a person or a family to spend a day in a Siwan garden after getting permission from the owner. Siwan people are good hosts to a stranger in their gardens and they always provide their guests with fruit. The typical Siwan garden looks wild and untidy, differing from the well-kept fields in the Nile Valley but seeming to look more natural (Fig (2.67)). The main reason for this is that the Siwan garden follows the principles of the natural process, which are completely different from the man-made ones applied in the Nile Valley. The recent problems which have appeared in the Oasis, like water logging, are a result of human intervention introducing new crops which need more water. The Siwan garden is usually far from its owner's house and it is rare to find the owner living next to the garden. The owner nearly always has a house in the urban mass where he lives with his family and he keeps a small cottage in the garden in which to spend the days he looks after his garden.

### **Summary**

The study of the traditional settlement will help us to rediscover profitable lessons from the past and will guide our future design. The foregoing discussion has highlighted how the traditional desert settlement has been adapted to the desert climate. It is obvious that the design of a building or town in a hot, dry area should differ from that in a wet zone; the more severe the climate, the more important this becomes. The compact planning concept which is oriented inwards to narrow, shaded streets and courtyard spaces is the most successful solution to the problems of a hot, arid climate. This concept has grown

out of the experience of generations in a long and old process of adaptation in areas where water is in short supply and vegetation hard to grow.

The landscape of the traditional urban form is characterised by sunlight and strong shadow and a sense of enclosure and privacy. Vegetation is scarce within the grouping of buildings, being found where water is provided and conditions favourable. The mass of buildings, being constructed of desert materials, are in great harmony with the surrounding landscape. The surrounding landscape is characterised by intermittent patches of palm grove which are integrated into the hard surface of the desert landscape and the urban mass providing admirable scenery.

The palm tree dominates the landscape of the Siwan garden ("Bos-tan"). The importance of this species arises from its historical, economic, nutritional and ecological significance. There are a number of characteristics which have an important bearing on both the traditional role of the date palm and its potential use in contemporary desert landscape design.

A Siwan garden is a good example of a desert garden; the plant community which grows and flourishes beneath a cover of date palm crowns emphasises the importance of the ecological principles. Also, the economic return from the palm trees supports the idea of a functional landscape which achieves both aesthetic and economic values at the same time. Running water in the shade is a gratifying thing in such a hot, arid climate and is greatly appreciated by desert residents. The Siwan garden looks more natural than the agricultural fields of the Nile Valley. There is no doubt that the traditional settlement does provide valuable principles in design which should be respected in any new desert development.





Fig (2.66) A typical palm rib fence of a Siwan garden which provides protection against hot, dusty wind and grazing animals (photo by the author).



Fig (2.67) The Siwan garden looks wild and untidy (photo by the author).

#### Notes and references:-

- [1] Laurie, M., "An Introduction to Landscape Architecture", American Elsevier Pub. Co., New York, p91.
- [2] Unterman, R. et al., "Site Planning for Cluster Housing", Van Nostrand Reinhold Co., New York, 1977, p33.
- [3] Said, R., "The Geology of Egypt", Elsevier PC, New York, 1962, p9.
- [4] Ibid, p9-11.
- [5] Ibid, p11-13.
- [6] Ibid, p12(B).
- [7] Ibid, p15.
- [8] Ibid, p16.
- [9] Ibid, p17.
- [10] Ibid, p20.
- [11] Ibid, p21.
- [12] Tandy, C., "Background", Cochrane,(ed.), "Landscape Design for the Middle East", RIBA, London, 1978, p7.
- [13] Sawyer, "Landscape Studies, An introduction to geomorphology", London, 1970, p96.
- [14] Godie, A., "The Warm Desert Environment", Cambridge Uni., 1977, p16.
- [15] Monir, M., "Sand Dunes in Egypt", Desert Institute, Cairo, 1983, p13 (Arabic).
- [16] Badran O., "Possibilities of land reclamation in Desert Area", Bishay, A. (ed.) et al., "Advances in Desert and Arid Land", Schweiz, 1979, p47.
- [17] Sawyer, op.cit., p98.
- [18] El-Baz, F., "The Western Desert of Egypt" in Bishay, op.cit., p74.
- [19] A.D.D.C., "Extension of 15th of May: Main Report", Cairo, 1980.
- [20] Cochrane, op.cit, p48.

- [21] Seddik, "Water Resources and Land Reclamation in Egypt", in Bishay, A., op.cit., p203.
- [22] Murray, I., Times, Nov. 5, 1987.
- [23] El Mahram International, Oct. 6, 1988.
- [24] Shata, A., "Development of Natural Agricultural Resources", in Bishay, op.cit., p59 - op.cit. Seddik, p201.
- [25] Ibid, p201.
- [26] Said, R., "The Development of Sinai", in Bishay, op.cit., p56.
- [27] Badran, op.cit., p46.
- [28] Ibid, p51.
- [29] Seddik, op.cit., p208.
- [30] M.H.R., "Suez Canal Regional Plan 1976", Egypt, 1976, p126.
- [31] Ibid, p126.
- [32] Seddik, op.cit., p210.
- [33] Cochrane, op.cit., p32.
- [34] Berg, "Drainage Systems and Management", FAO/UNESCO "Irrigation, Drainage and Salinity", London, 1973, p333.
- [35] Letter, "Egypt, a case of ecological vulnerability", Letter to the Conservation Foundation, August 1983, p1.
- [36] Usher, S., "Irrigation Techniques", Ali, T. (ed.) et al., "Landscape design for the Middle East", London, 1978, p64.
- [37] Walter, "Ecology of Tropical and Subtropical Vegetation", Shaltart, 1971, p279, 280-282.
- [38] Abdin, "A Bio-Climatic Approach to House Design for Semi-Desert and Hot Climate with special reference to Egypt", Liverpool Uni., Ph.D., 1982, p107.
- [39] Walter, op.cit., p239.
- [40] Badran, op.cit., p51.
- [41] M.H.R., op.cit., p71.

- [42] Badran, op.cit., p46.
- [43] Walter, op.cit., p293.
- [44] Berg, op.cit., p155.
- [45] Hassan, M., "Salinity hazard and water logging in the area west of Noubaria Canal", Bishay, op.cit., p85.
- [46] Gillespie, W., "Master Plan Studies for the Suez Canal Region", Landscape Design, 1980, p19.
- [47] Louw, G., "Ecology of desert organisms", New York, 1982, p114.
- [48] Walter, op.cit., p273.
- [49] Hough, M., "City Form and Natural Process", Sydney, 1984, p28.
- [50] Konya, A., "Design Primer for Hot Climates", London, 1980, p11.
- [51] Ibid, p13.
- [52] Cochrane, op.cit., p27.
- [53] Ayyad, M., "Hot Deserts of Egypt and Sudan", Evenart, M. (ed.) et al., Hot Desert and Arid Shrublands, Elsevier Science Publishers, Amsterdam, 1986, p155.
- [54] Walter, op.cit., p463.
- [55] Godie, op.cit., p23.
- [56] Adams, R., et al., "Drylands, Man and Plants", London, 1978, p47.
- [57] Ayyad, op.cit., p160.
- [58] Walter, op.cit., p468.
- [59] Ali, T., op.cit., p84.
- [60] Adams, op.cit., p55.
- [61] Badran, op.cit., p49.
- [62] Adams, op.cit., p58.
- [63] Louw, op.cit., p171.
- [64] Ayyad, op.cit., p171.
- [65] Ibid, p172.

- [66] Turner, T., "Notes on Social Science and Technical Aspects of Environmental Design in Egypt", Cairo, 1975, p9.
- [67] Bruum, B., "Common Birds of Egypt", Cairo, 1985, p7.
- [68] Ayyad, op.cit., p177.
- [69] Ibid, p177.
- [70] Ibid, p178.
- [71] The Economist, "Year of the Locust, again", The Economist, May 17 1986, p60.
- [72] Hough, op.cit., p5. Ian McHarg, "Architecture, Ecology and Form"; Univ. of Pennsylvania, 1965. Lewis Mumford, The City in History, New York, 1961.
- [73] Louw, op.cit., p42.
- [74] Ibid, p145.
- [75] Ayyad, M., "Ecology: Introductory Notes", Alexandria Uni., 1978, p87.
- [76] Monier, M. (ed.), Desert Institute, "Sand dunes in Egypt", Egypt, 1983, p110.
- [78] Adams, R., et al., "Dry lands: Man and Plants", London, 1978.
- [79] Cochrane, op.cit., p7.
- [80] Ayyad, M., "The Samedene Project", op.cit., Bishay, 1979, p100.
- [81] Roth, T., "Repercussions of the Asswan Dam", "Gartent Landschaft", Nov./1979, p337.
- [82] Ibid, p339.
- [83] Walter, op.cit., p270.
- [84] Ibid, p1.
- [85] Laurie, op.cit., p151.
- [86] Ibid, p154.
- [87] Ibid, p155.
- [88] M.H.R., p21.
- [89] Khodarie, A., "New Town Location in the Greater Cairo Region", Ph.D. Liverpool Uni., 1986, p167.

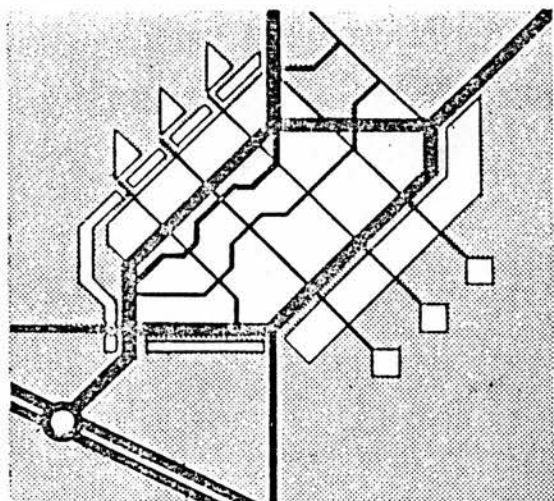
- [90] El Kassas, "Education and Training", Bishay, op.cit., p32.
- [91] Wenkmeister, "Opening Remarks", IFLA Year Book, 1985,86, p160.
- [92] Hyland, A. (ed.), et al., "Housing in Egypt", Uni. of Newcastle, 1986, p3.
- [93] Ayad, M., "Towards housing policy for Egypt", Liverpool Uni., Ph.D., 1983, p164.
- [94] Economist, "Egypt: the riot-stopping riot", The Economist, March 1 1986, p37.
- [95] Cochrane, op.cit., p23.
- [96] Mostafa, S., "The Islamic principal in the design of the courtyard house", Architecture and Planning Studies Centre, Cairo, 1986, p60.
- [97] Abdelhalim, A., "Transformation in Architecture and Urbanism", The Aga Khan Awards, 1985, p44.
- [98] Davidson, F., "Aid and urban development in Egypt", Open House International, Vol. 10, No. 3, 1985, p10.
- [99] Khodarie, op.cit., p165.
- [100] Letter, "Cairo, a Third World City in Growing Trouble", The Conservation Foundation, 1983, p4.
- [101] Lynch, K., "Site Planning", London, 3rd ed., 1984, p257.
- [102] Ayay op.cit., p163.
- [103] SWECO, "10th of Ramadan Master Plan", Cairo, 1976, Vol. 7, p6.
- [104] Turner, op.cit., p9.
- [105] Zube, E., "A Cultivated Dislike for the Egyptian Desert", Landscape Architecture, Nov./Dec., 1983, p83.
- [106] Hyland (ed.), op.cit., pIV.
- [107] Fathy, H., "Human settlements in newly reclaimed land", op.cit. Bishay, p539.



- [108] Fakhry, A., "The Oases of Egypt", Volume 1 Siwa Oasis, Cairo, 1973, p7,8.
- [109] Sameh, H., "Planning & Architectural Criteria with respect to Climatic Conditions", Report, Cairo, 1987, p54.
- [110] Fathy, H., "Vernacular Architecture", Chicago Uni., 1986, p63.
- [111] Ibid, p65.
- [112] Fakhry, op.cit., p12.
- [113] Walter, op.cit., p445.
- [114] Larsen, T., "Siwa: Oasis Extraordinary", ARAMCO WORLD, Vol. 39, No. 5, Sept.-Oct., 1983, p6.
- [115] Fakhry, op.cit., p14.
- [116] Larsen, op.cit., p3.

## PART II

### TOWN SCALE



## PART II

### Chapter 3. A landscape brief for Egyptian New Towns

#### INTRODUCTION

New development and urbanization policies should be examined against the lessons of past experience. This study assumes that an evaluation of the accumulated experience gained through the formulation and implementation of new development policies in desert environments, such as 10th of Ramadan and Sadat City, would be useful in future development projects in arid zones.

In this chapter there are three essential stages in landscape development of a new town area; an introductory stage which requires the identification of existing landscape features and their interrelationships with natural factors (human, ecological and visual) and man-made factors - at the completion of this stage the research is ready for analysis leading to evaluation; an intermediate stage in which the landscape features need to be interpreted and evaluated in terms of opportunities and constraints of the proposed new development - the evaluation stage being concerned with the dialogue between ecological and economic potential and the micro-environment and aesthetic requirements, the central feature of this latter being an assessment leading to a proposed solution or to alternative or partial alternative solutions. The final stage then, following the earlier two, is an identification of the landscape process of the new town in carrying out an overall view of the landscape design problems in the E.N.T.

Two case studies are presented in this section of the thesis, as typical of the E.N.T. programme, the 10th of Ramadan and Sadat City. Each of these is assessed at its introductory, intermediate and final

stages of planning in order to reveal the extent to which a landscape brief was identified and expressed in the final town plans. The content and sequence of research in this chapter is shown in diagram (3.1).

Before the examination of the E.N.T., the circumstances of the site selection of the E.N.T. should be briefly elucidated. This elucidation endeavours to illustrate to what degree respect for the landscape was considered as a criteria in the site selection of the E.N.T. in relation to landscape principles. This is an essential step which should be identified and which should precede any evaluation studies. "Choosing a proper site for arid land settlement is the most important step in the process of planning and development. The planner has to consider such general factors as the public strategic and economic forces as well as the prototypical arid land characteristics" [1].

As mentioned before, there are certain criteria which must be considered when choosing an arid land site, specifically relating to climate; comfort and physiography; hydrology and environmental quality. "Today many cities are paying high prices, socially, economically and educationally, and residents are paying mentally for poor site selection" [2]. Often in the selection of sites for E.N.T. there has been a lack of collection and analysis of comprehensive site data. In these, intuition rather than rational, orderly and methodical choice has dictated choice. A. Khodarie, whose research (Ph.D. 1985) deals with the determination of factors affecting site selection of new towns in Egypt says:

"The absence of a comprehensive planning cycle in Egypt has led to the creation of a gap between the adopted idea of creating new towns and their direct master plan reports, which often gives no indication as to how the site was selected, which technical processes followed, and at what level of planning it was adopted" [3] and he adds: In general a

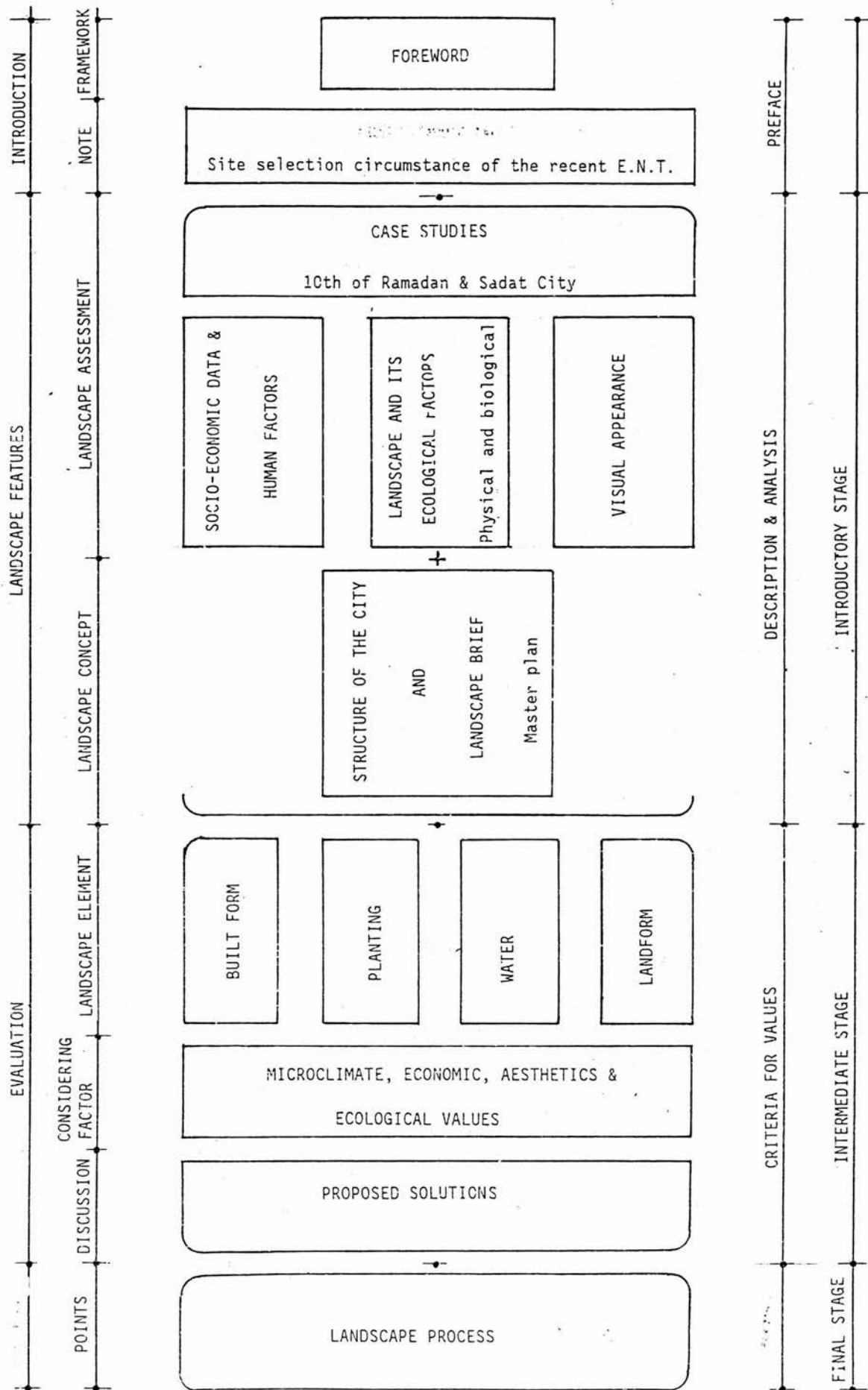


Diagram (3.1) Shows the content and sequence of research in this chapter (drawing by the author).

few criteria such as slope, soil were considered but it was not followed by any detailed studies. Therefore, many striking errors have been made. For instance, Sadat New Town is subject to a long season of sand storms and so requires expensive belts of trees [4]. Again, the selected site for 15th of May was previously subject to flooding and this has subsequently required the construction of an expensive embankment (some eight million EP equivalent to 8000 units of low income housing) around the site, with storm water pumping facilities for use during the monsoon [5]. The same site is subject to heavy pollution in the form of dust from nearby cement and steel factories and from surrounding limestone hills [6]. Again, in the 6th of October New Town, the lack of detailed soil studies has led to serious problems in foundation and drainage construction. The cost of the mains drainage was unnecessarily increased sixfold by digging it through hard granite rather than through sand [7]. This problem could have been solved if the line had been moved 100 meters away. Again in many parts of this new town red-soil is found - a soil type particularly troublesome with building foundations through its expansion when wet. Yet again the site of El Ebour new town was selected within a dune system.

The above are examples of new towns which seem to have been planned with ignorance of such basic considerations as the local microclimate and have therefore produced unnecessarily uncomfortable conditions for the inhabitants.

Even in some of the recent researches, ignorance of the importance of some physical investigation for the E.N.T. site selection has also occurred. A. Khoday in 1986 (Ph.D.) considered 19 physical factors (Table (3.1)) affecting new town locations around Cairo. He presented grid cells with the help of a computer analysis, illustrating the available areas for potential locations new towns. These show a greater



| 1. Initial Personal Reconnaissance of Physical Data and Construction Preliminary Schedule  |  |  |  |  |  |  |  |  |  | 2. Pilot Survey of Collected Data  |  |  |  |  |  |  |  |  |  | Results from Stages 1 and 2   |  |  |  |  |  |  |  |  |  |                         |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|-------------------------|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|
| 1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2. Egyptian New Town Master-Plan Reports   |  |  |  |  |  |  |  |  |  | 2.1. Aggregate of the Physical Observations of Egyptian Planners and Experts  |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1. Professional Consultants of the General Organization of Physical Planning                                       |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                                     |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                                   |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                                     |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                                 |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                                   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                                 |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                                 |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                               |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                               |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                             |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                             |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                           |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                           |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                       |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                         |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                     |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                       |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                   |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                     |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning                 |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning               |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities                 |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                                       |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning             |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities               |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                                     |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning           |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities             |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                                   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning         |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities             |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                                 |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning         |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities           |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                               |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning         |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities         |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                               |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning       |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities       |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                             |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning       |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities     |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                           |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning     |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities     |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                         |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning     |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities     |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                       |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities     |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                     |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning   |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide                   |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities   |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1. British Experience and the Experience of Writers in this Field - World Wide |  |  |  |  |  |  |  |  |  | 1.2.1. Professional Consultants of the General Organization of Physical Planning |  |  |  |  |  |  |  |  |  | 2.1. Leaders and Decision Makers of Different Authorities |  |  |  |  |  |  |  |  |  | 2.2-Individual Scanning |  |  |  |  |  |  |  |  |  | Proposed Checklist of the Physical Factors which Affect the Decision of Locating the Proposed New Town in the Cairo Study Area (C.S.A.) |  |  |  |  |  |  |  |  |  |
| 1.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |                         |  |  |  |  |  |  |  |  |  |   |  |  |  |  |  |  |  |  |  |

likelihood of being located in the Western Desert of Cairo rather than the Eastern Desert. From the examination of the previous study, it is found that the author has ignored or placed little value on the ecological factor and landscape rarity factor (area has a special landscape value), by considering the two factors of little consequence in the new town locational decision (Table (3.1) above). His final discussion indicates an imbalance of perception and warrants further consideration of these two aspects. This imbalance of perception is a result of misunderstanding. The designation "desert" needs to be reversed and understood.

In general, it is clear that the sites of some of the existing new towns were selected arbitrarily without any previous comprehensive regional studies. This may explain a part of the problem in the following sections. At the same time the landscape and ecological considerations are not well understood in the site selection of E.N.T. The selection of new town sites and understanding of the dry and harsh desert environment is perhaps more challenging than in any other areas.

In the following section, both of the two selected case studies will be separately studied through examination of the landscape features which will involve the site assessment and the landscape design concept for each town.

An assessment of the facts and forces which have formed the landscape will be presented in this section. Firstly, the socio-economic data and human factors will be presented. The historical association of events and land use will be illustrated as well as the present disposition of land and population, settlements and industry. This will be a thorough examination of historical background, purpose of creation, national location, size of the town, population and demography and land use analysis. Secondly, the coherent set of relationships between

physical data (landscape factors) (geology, soil, water, climate) and biological data (vegetation and wildlife) will be examined. Thirdly, an assessment of the important view representing the interaction of the foregoing factors (in and out) of the site (visual appearance) will be made. All elements fundamental to visual quality will be illustrated.

The landscape design concept adopted in each town will be examined through the Master Plan. This will be concerned with landscape character, landscape design objectives and the structure of the city and its landscape planning concept. This will include roads, industrial, residential and public open space areas.

The author had visited some of the British New Towns before visiting the E.N.T. sites, in order to gain insight into the landscape of European new towns. Welwyn Garden City, Milton Keynes and Cumbernauld New Town were visited and the Development Corporations of these new towns were approached. The author then visited the E.N.T. sites during the months of January, February and March 1987 to collect data and information for the research (see Index: Field Studies). Five sites of the proposed E.N.T. were studied and visited. The Development Corporations of each new town were approached and meetings with the authorities were held. Unfortunately, in every instance there was a great lack of reliable data about the awareness of landscape design. This led to reliance on direct observation to record what was actually unrecorded and to compare between what had been proposed in the planning reports and what was actually implemented. Other relevant organisations were consulted as were the inhabitants of the E.N.T. The information centre of the Ministry of Housing and Reconstruction was also visited and most of the planning reports were obtained from this source. Since each site used in these case studies is different, each must be assessed individually in the introductory stage as shown in Diagram (3.1a). The major

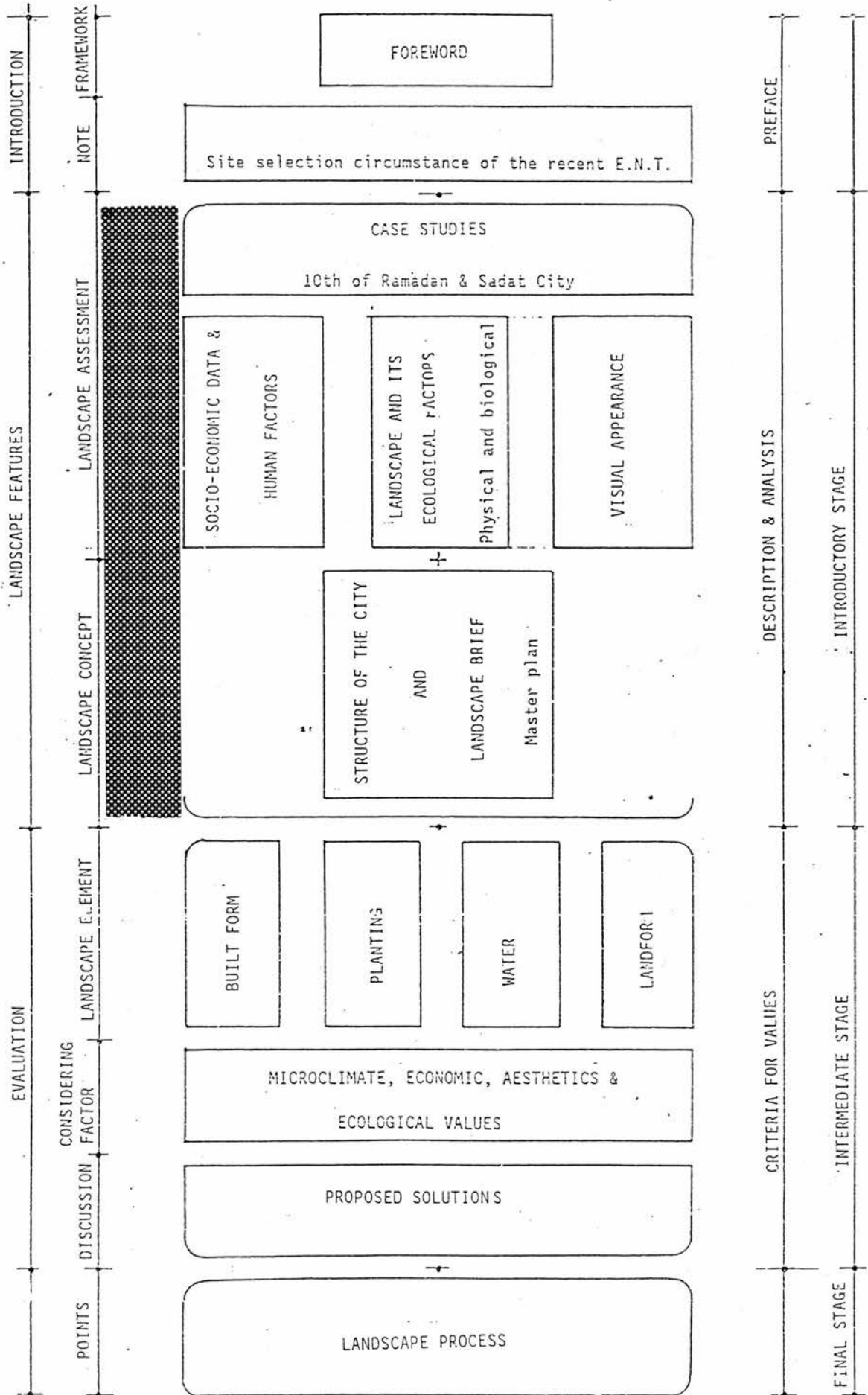


Diagram (3.1a) Shows the content and sequence of research in this section (3.1 Landscape features) for each town (drawing by the author).

sources for this following section are the main reports of 10th of Ramadan new city and Sadat city [8]. Each city will be examined **only** in the form of description and analysis at this stage. In the next stage, an evaluation (3.2) will be made for both of them together.

Case study I  
10th of Ramadan

R.3.1 **LANDSCAPE FEATURES OF 10TH OF RAMADAN**

R.3.1.1 **Site assessment**

a) **Socioeconomic data**

The 10th of Ramadan is one of the independent cities suggested in the Greater Cairo Regional plan (1974). It was the first of the new towns to be built, the actual construction having been started in 1977. The new city is a combined industrial/urban project, located in the desert area 50 km north-east of Cairo along the Cairo-Ismailia Highway (Fig (3.1)).

The original basic objectives of the new town were to increase national and regional income, to provide opportunities for relieving population pressures in Cairo, to increase the industrial base of the country, and to diversify and improve employment opportunities. A target population of 150000 as a first stage was established up to 1985, building up to 500000 in the following 25 years.

The actual population and its growth will depend on the supply of employment opportunities. A rapid increase in employment possibilities will, for example, be likely to attract a large number of predominantly unemployed and underemployed workers from Cairo and the rural areas. The employment structure in the new city will change with time. A rough estimate of the future composition of the labour force of the city is shown below (Table (3.2) and source). The expected population consists



# THE MEDITERRANEAN SEA

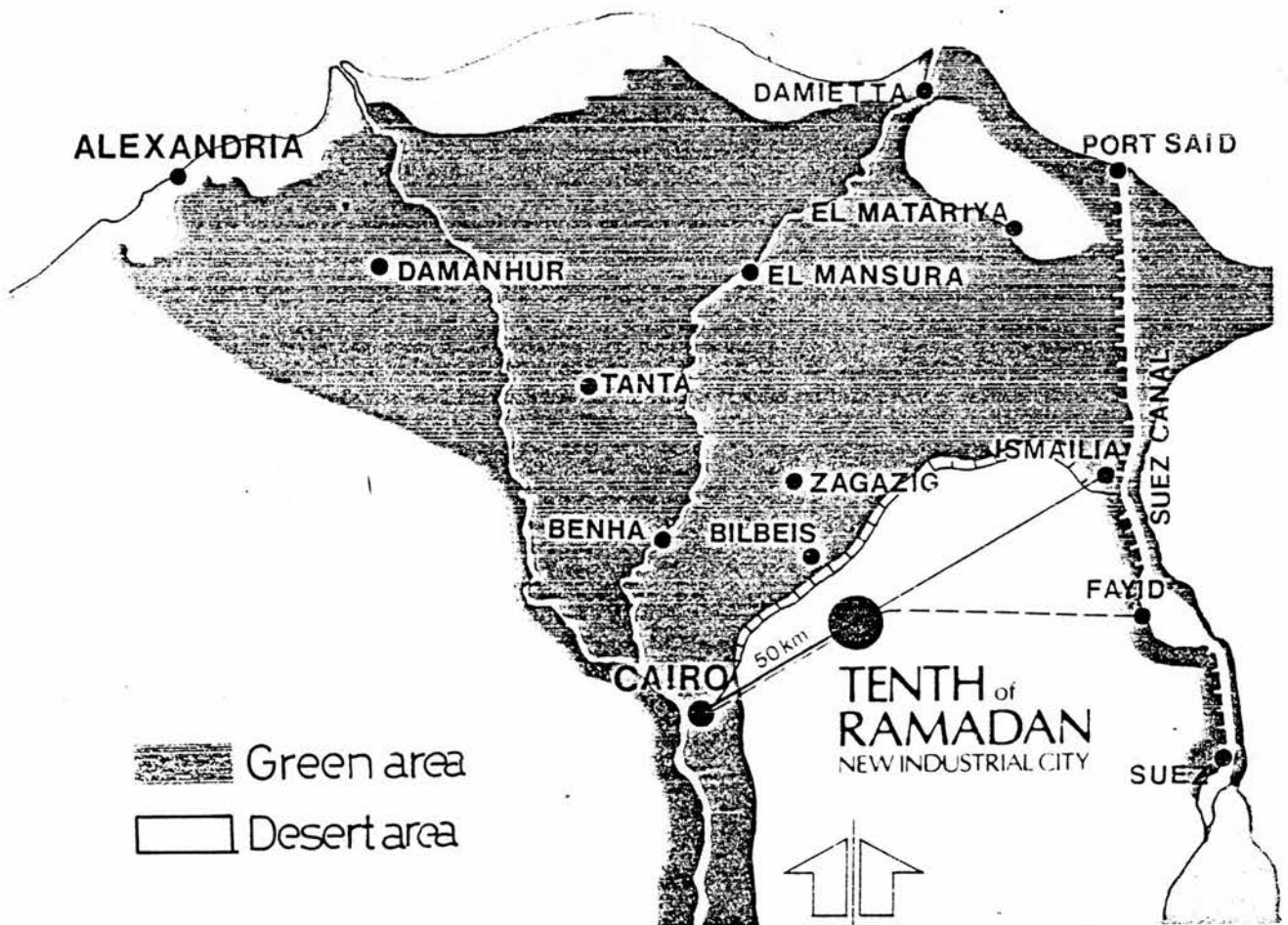


Fig (3.1) Shows the location of 10th Ramadan. The city is located 50 km north-east of Cairo, along the Cairo-Ismailia Desert Road (SWEEO, Short Description, pp3).

Table (3.2)

|           |  |
|-----------|--|
| 5 - 7 %   | High-level (managerial and scientific) |
| 25 - 30 % | Middle-level (office and trade)        |
| 45 - 55 % | Workers (skilled and unskilled)        |
| 2 - 5 %   | Farmers                                |
| 5 %       | Unemployed                             |

SWECO, Master Plan, 1976, Vo, p6

mostly of young people. The city was designed by SWECO, Stockholm, in association with S. Zeitoun, Cairo [8].

The total area of the city covers almost 30800 ha divided into the following land use. Table (3.3) shows the land use of 10th of Ramadan (A. Hyland, Ed., 1986, pp83).

Table (3.3)

|             |       |     |
|-------------|-------|-----|
| Residential | 12000 | 39% |
| Industrial  | 6000  | 19% |
| Services    | 2000  | 6%  |
| Green areas | 3000  | 10% |
| Roads       | 7800  | 25% |
| Other       | -     | 1%  |

The site for 10th of Ramadan is in a desert region. The northern part, adjacent to the Ismailia Canal which extends into this area, might itself possibly be utilized for agricultural purposes (Fig (3.2)).

The existing area is known as Wadi al Garffa (a nomadic name), now replaced by 10th of Ramadan. The new name of the area was inspired by political influences. There are no historical or remarkable places except the Khanka sand dune area, along the Cairo-Ismailia Desert Road south-west of the city (Fig (3.3)). This has a distinctive topography providing local identity and worthy of preservation in any design scheme.

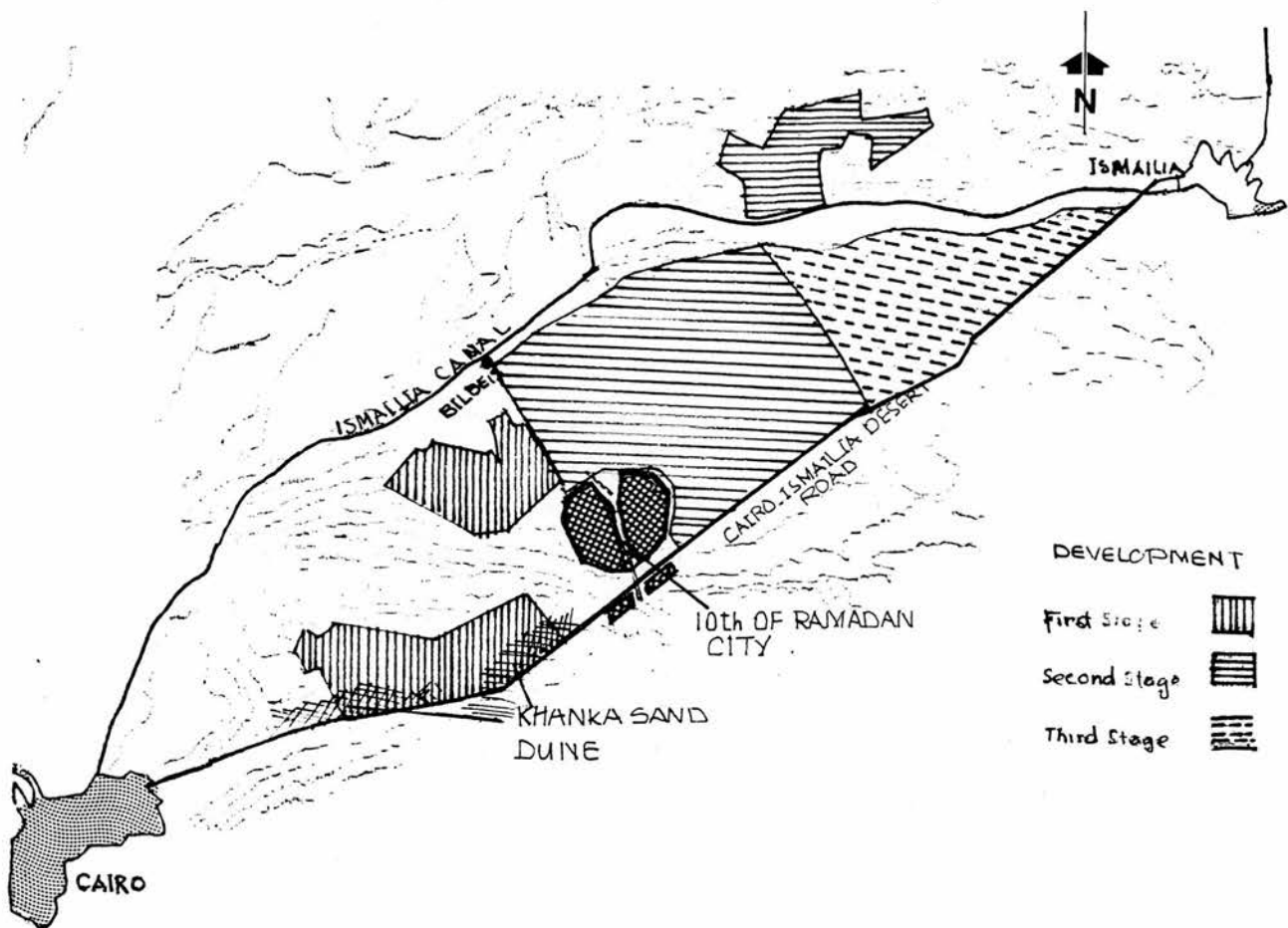


Fig (3.2) Land reclamation near the Cairo-Ismailia Desert Road. As it is shown the northern part of the 10th of Ramadan's site will be utilized for agricultural purposes (Attaia, 1984, pp232).

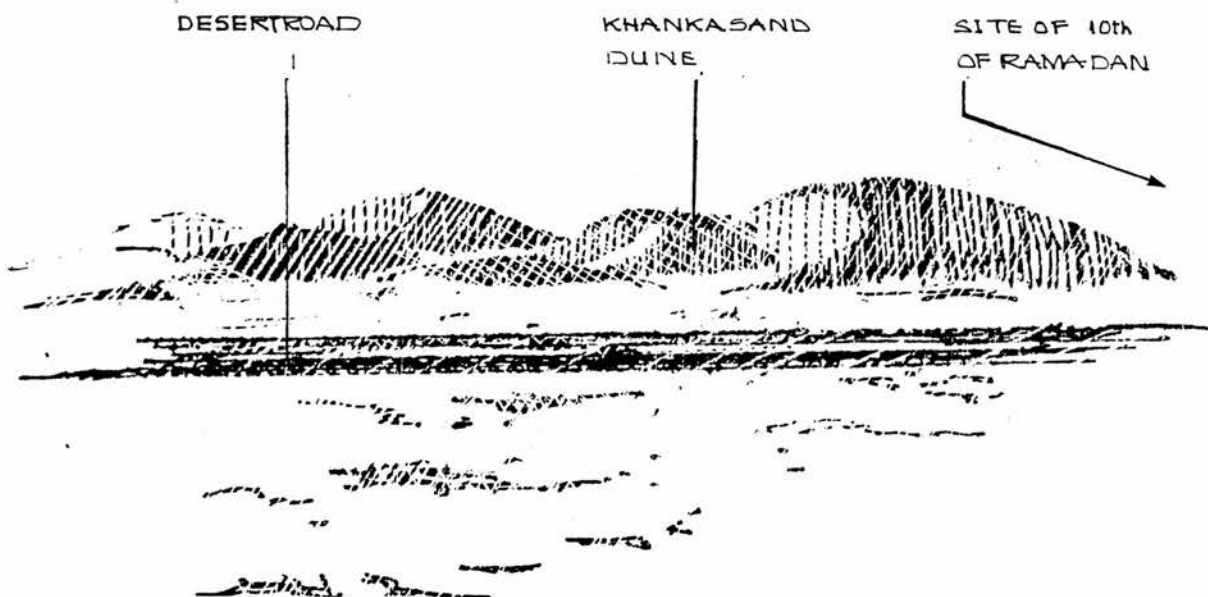


Fig (3.3) The Khanka sand dune area with its distinct topography Cairo-Ismailia Desert Road. (sketch by the author).

## b) Landscape and its ecological factors

### **Geology**

The upper Eocene sandy limestones and Miocene sediments form the characteristic landscape scenery of the area with gravels and sand covering it. The Miocene sediments are divisible into two units, a lower unit made up of richly-fossiliferous marine sediments and an upper unit made up of non-marine fluivatile sediments [9].

The topographical map has been drawn using the computer CAAD of Edinburgh University and a cross-section A-A has been made (Fig (3.4)). It shows that the topography of the site is characterized by a gentle slope from the south (+ 140) to the north (+ 70). From field observation of the site, it can be stated that the dominating feature of the landscape is its relative flatness. Therefore, the landscape tends to appear quite open and expansive, a typical desert pavement covered with sand and gravels. The main geological feature of the site indicates that recent geomorphological erosional forces have had more effect on the site than the type of underlying structure bed form. Wind action by its degradation and accumulation still shapes and affects the landscape of the site. Water action in the form of storm water has some affect in wadi areas in the southern area of the site. It can cause landslides and remove soil.

### **Hydrology**

The main water supply for the city will eventually be from the Ismailia Canal north of the city (Fig (3.2) above). The Ministry of Irrigation has indicated that a future maximum quantity for the new city of 4000000 qm is to be obtained from Nile water. The first stage development depended on ground water from 20 wells located to the north-east of Bilbeis Road (Fig (3.5)). The wells are capable of producing 20000 qm per day. It is proposed to use water from sewage treatment for

A'

tenth  
of ramadan  
C Interval : 5.0  
Vert.Ex : 0.0

grousedata/tenth

User: root

tenth  
of ramadan  
C Interval : 5.0  
Vert.Ex : 5.0

Model: 1000.0,1000.0m

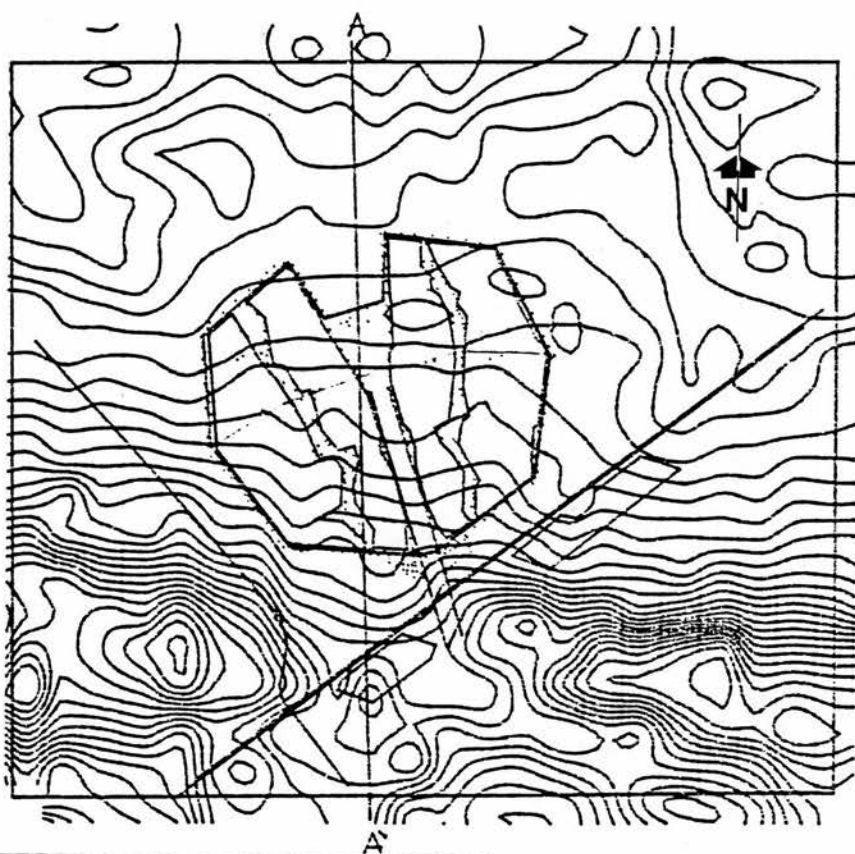
Scale 1 : 59242.0

Model: 1000.0,1000.0m

Wed Jul 22 1987

Scale 1 : 200000.0

Drawn by Grouse  
Gillespie's ( DeCAL )



↑ 15500 m

Fig (3.4) The topographical map of 10th of Ramadan. Section A-A shows the gentle slope of the site from south (+140) to north (+70) (drawing by CAAD).

A

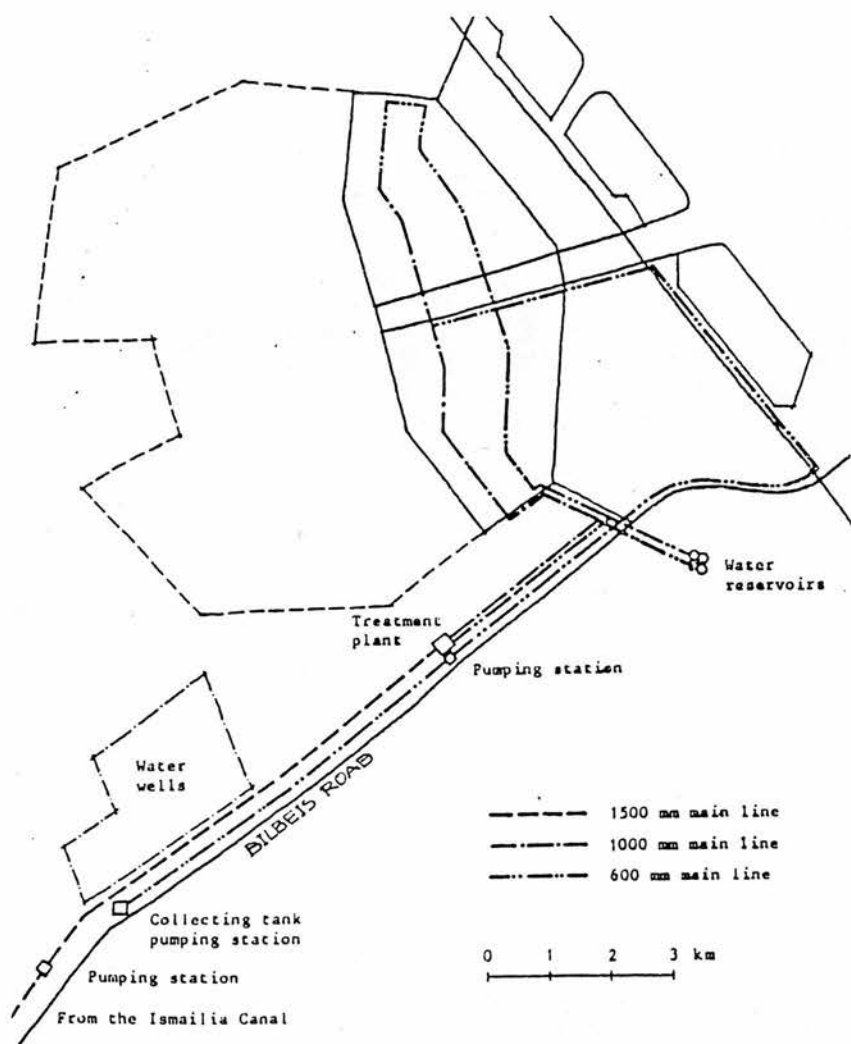


Fig (3.5) Water supply and distribution for 10th of Ramadan (SWECO "Growth Plan", 1983, pp27).



plant irrigation around the city. Precipitation from rain is very limited; annual rainfall is only 23 mm, the rainy seasons being from October to April. Rainfall in the area is generally insufficient to sustain concentrated planting and is unreliable both in quantity and time of occurrence. High evaporation and runoff from the desert site increase the shortage of water.

The water demand of 10th of Ramadan, divided into different categories of consumption, was estimated as follows in Table (3.4) (SWECO, Master Plan, 1976. Vo, p75). There was no indication that the Table (3.4)

| Max. demand m <sup>3</sup> /day          | Year 10 | Year 25 |
|--|---------|---------|
| Population                               | 150000  | 500000  |
| Domestic consumption                     | 39000   | 157000  |
| Industrial consumption                   | 21000   | 83000   |
| Allowance for water consuming industries | 50000   | 100000  |
| Irrigation                               | 36000   | 120000  |
| Total, rounded off                       | 150000  | 460000  |

availability of water supplies had been studied in relation to landscape design in the Master Plan studies. The surface irrigation used in the site is impractical for desert soil and climate. Water in the site is a limited and scarce resource.

### Soil

Three soil types are found within the area of the city. A highly saline alluvium is predominant, with smaller areas of either less saline alluvial fan soils or fertile wadi soils. The highly saline alluvium requires short flushes of water every ten days or so to maintain it in culturable condition, otherwise evaporation losses to the atmosphere quickly draw up and replace the salt leached away in the flushes. The

scale of such treatment depends critically upon the amount of water available since the volume needed for a single flush of one feddan is 1500-2000 m<sup>3</sup>. The moderately saline alluvium soil, on the other hand, will support at least some plant cover without treatment. Wadi soils, being the most fertile, require the most careful conservation, but even these may be improved by the addition of further organic matter. In general, the site's soil is one of the major determinative factors for planting. The soil salinity which always develops as a result of surface irrigation is also one of the obstacles affecting planting areas.

### **Climate**

The interacting variable forces of wind, precipitation, temperature, humidity and solar radiation are the great climatic forces that have shaped the landscape in the area. The site is characterised by high temperature and radiation. The temperatures round the area reach 49°C (in July and August) but can fall to 7°C (in December-March). The average mean varies between 13°C in January and 27°C in August. The surface temperature is illustrated in Fig (3.6). Wind plays a significant part in the existing landscape. The south-west and south-east winds are always hot and drying (Khamsin) which increases the aridity and creates sand or dust storms. They can increase the heat stress in plants and cause wilting, and so any planning concept needs to provide good protection from the Khamsin wind. The north, north-west and north-east winds are always associated with early morning fog or mist which veil the view for the early two hours; the north and north-west winds are accompanied in winter by showers of rain. The annual percentage frequency of surface wind direction is illustrated in Fig (3.7).

The dry climate is the main feature of the area, the average annual rainfall being only 23.5 mm. This figure seems unimportant, but when it

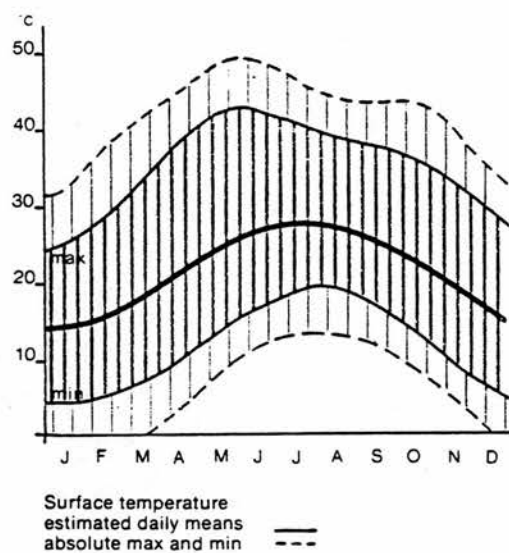


Fig (3.6) Surface temperature of 10th of Ramadan area (SWECO "Master Plan", 1976, vo, p33).

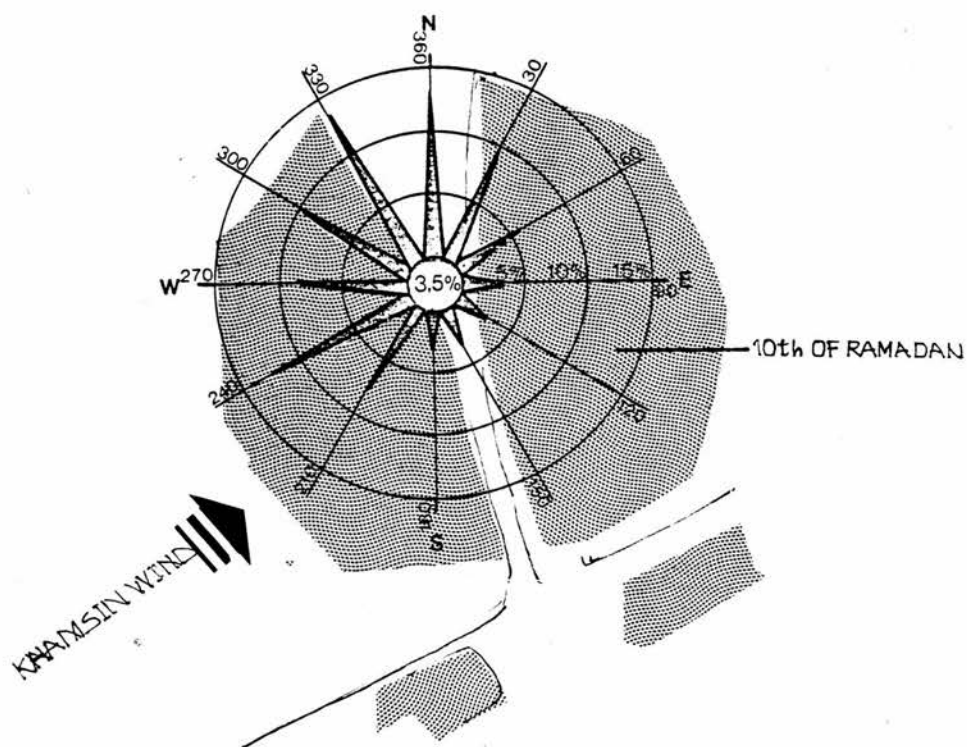


Fig (3.7) Annual percentage frequency of surface wind directions (SWECO "Master Plan", 1976, pp34).

occurs infrequently, it causes rainstorms and flood damage. Rapid evaporation of water is noticeable after rainfalls, which has great influence on the plant community and the landscape.

Microclimate conditions may be expected to be basically similar to the description above, because there is no specific area which differs from the other. It could be summarised as: hot, dusty winds, summer heat, winter cold, humidity and glare are frequent causes of climatic discomfort. The climate has also had a major influence on the way of life of the people and their culture. Climatic design should be considered to produce favourable microclimatic effects.

### **Plants and wildlife**

The area is poor in natural vegetation owing to its low rainfall and the coarse texture and salinity of the soil. This typical desert environment allows little except scattered shrubs to grow on the site and these have been reduced to a minimum by over-grazing. The seasonality of ephemeral plants is the most remarkable feature of the site surroundings, especially in winter. Perennial plants are dominated by some shrubs such as Zygophyllum coccieum, Zilla spinosa, Anabasis articulate and Retamos peatam. Some of these species are able to maintain a fresh appearance throughout the whole year. Fig (3.8) shows some of the wild plants on the desert road near 10th of Ramadan and Fig (3.9) shows some detail of these plants. The plant community is described by identifying its location (type of soil associated with it) and its dominant plant species. Indigenous plants are non-existent within the new development area of the site.

There is also no significant sign of wildlife except for some common birds in desert areas and a few wolves. Man's interference in the delicate desert ecosystem in the form of gravel and limestone mining operations may be the main reason for the scarcity of wildlife in the



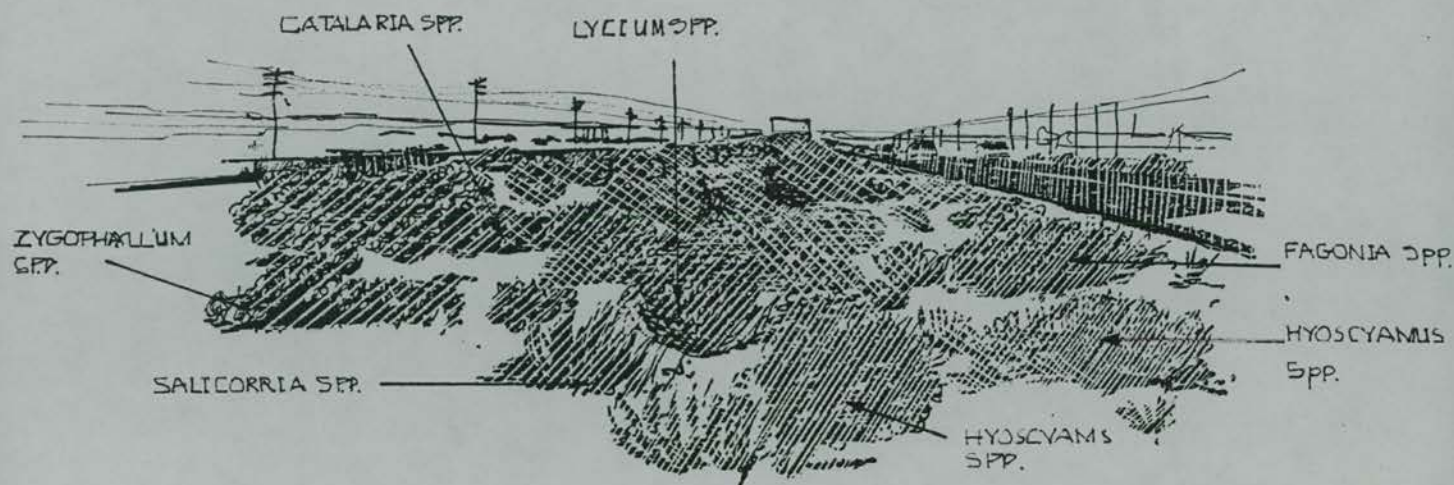


Fig (3.8) Shows some of the wild plants that can grow with annual rainfall of 23 mm - Cairo-Ismailia Desert Road near 10th of Ramadan -(sketch by the author)

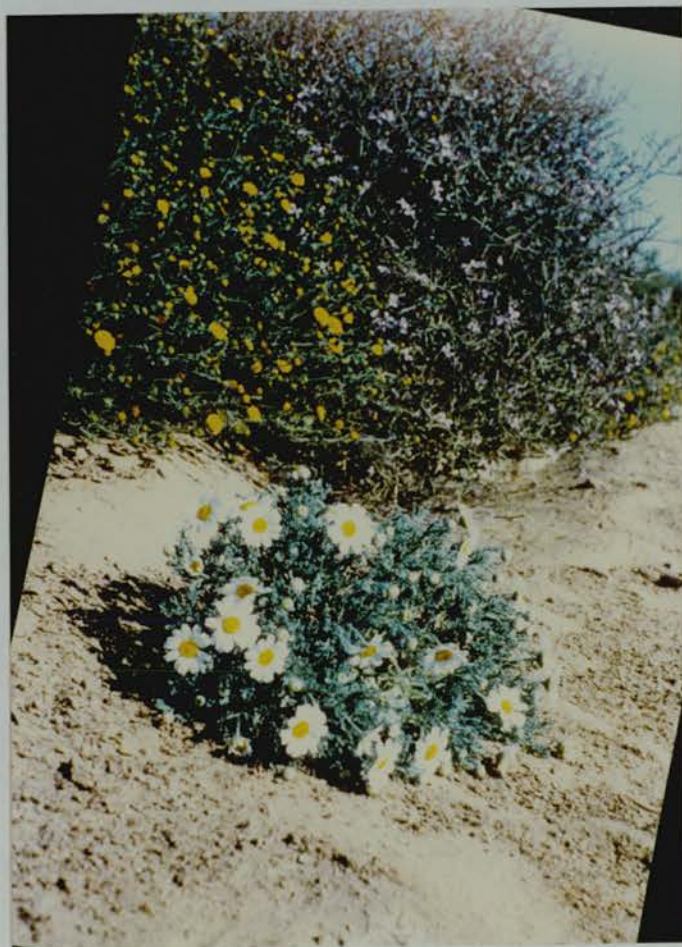
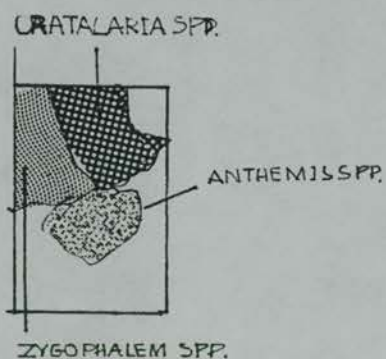


Fig (3.9) Shows some detail of the previous figure (ephemeral and perennial spp.) (photo by the author).

area. Also, the productivity of a desert site is limited in comparison with wetland. The new environment created by the new development has encouraged some wildlife to inhabit the place, notably desert birds.

c) **Visual appearance**

Each site has its own character. Using photographs, site observation and computer analysis an assessment has been made of the important skylines and views (in and out) of the site which would have a major impact on the environment. Understanding overall site qualities can provide a positive contribution to the character of the design.

Views out of the area: Views from most points are almost the same. The north-east and westward views show an open extent of level desert land as is illustrated in Fig (3.10). The only notable feature is the view towards the south where hills with gentle slopes appear in the background (Fig (3.11)).

View into the area: There is no prominent feature which could be recognized within the area as the site is dominated by level land (Fig (3.12) and Fig (3.13)). The view from the highest point indicates the level landform (Fig 3.14). Also, the view to the main entrance of the city shows it has no special character (Fig (3.15)).

In general, the visual analysis indicates that the quality of landscape is such that production of numerous skylines is limited; the visual diversity does not exist. The site gets its individuality from the plain desert which dominates the landscape except in the southern part, where gentle hills appear in the background. However, these hills could be site danger signals when dust from the hills blows up and covers the city with the south wind. The level land creates an open, spacious, exposed feeling (in and out) of the area. It may be said that the views out of the area are unattractive and the views into the area are undistinguished. This raises the importance of the introverted





Fig (3.10) View out north-westwards A. It has a great spacious desert landscape without any remarkable feature to create identity (photo by the author).

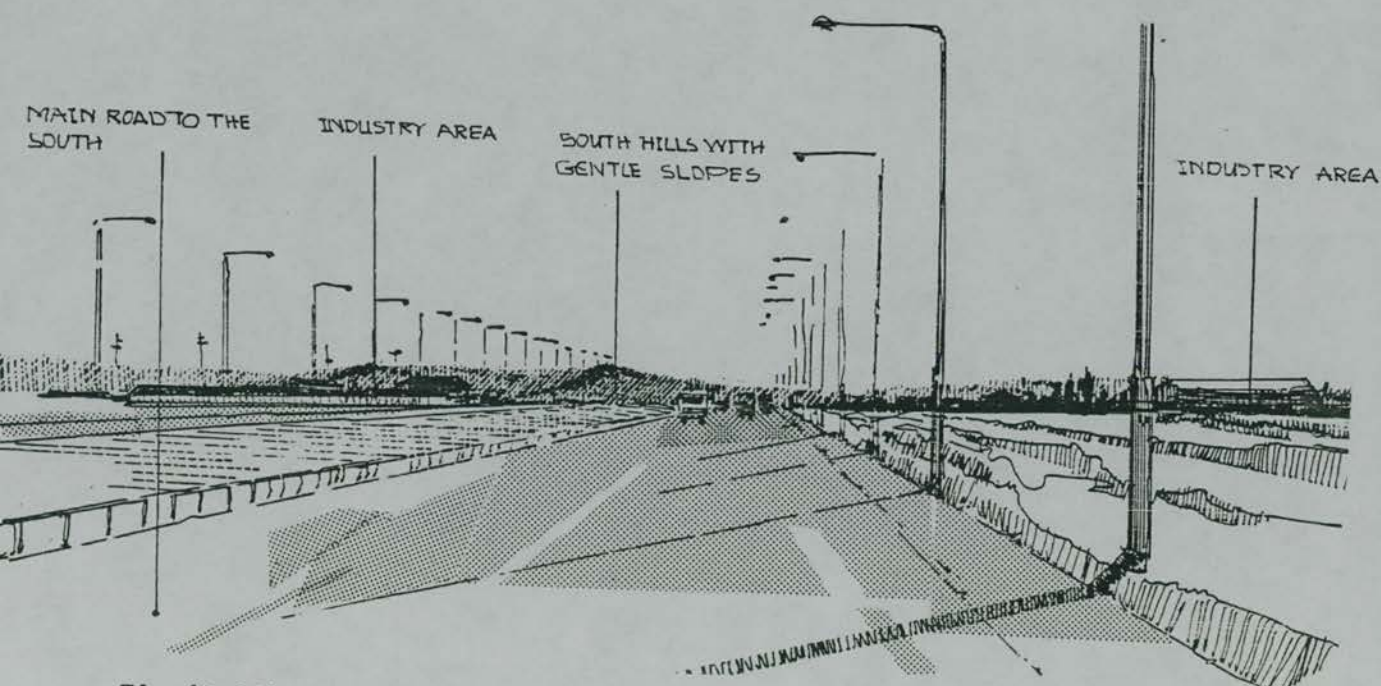


Fig (3.11) View to the south B. It shows the view from point B south over the industrial area with the hills appearing in the background. The hills define the skyline providing with its gentle slopes a coherent landscape structure (sketch by the author).

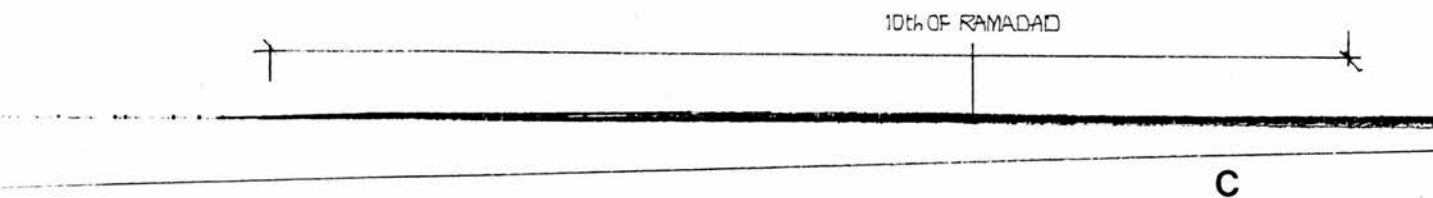


Fig (3.12) Shows a view into the site from the lower point C of the site. It shows the view from eyepoint; the skyline looks flat which indicates the flatness of the site and emphasizes the extended level desert landscape (drawing by CAAD, Edinburgh University).

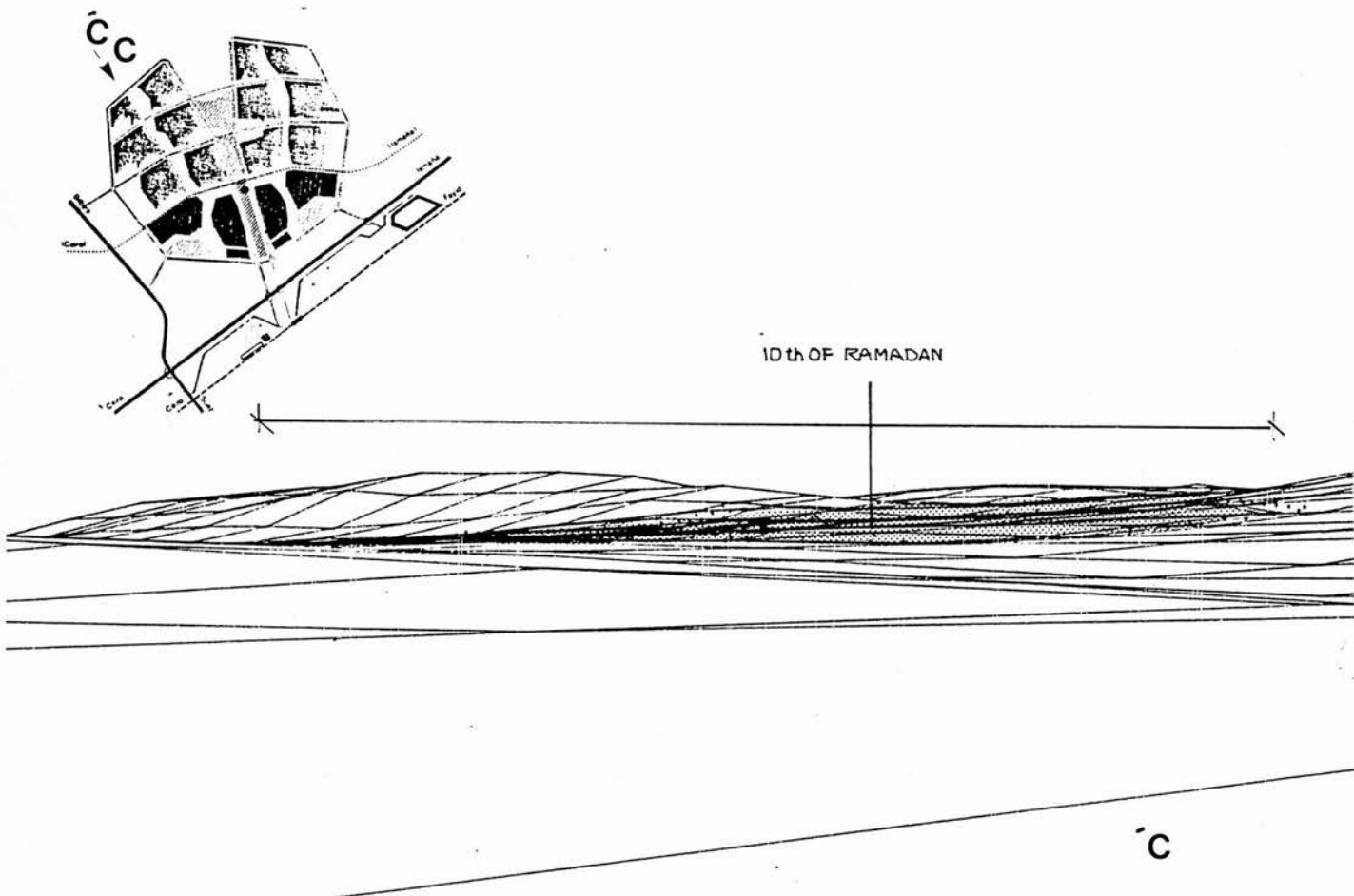


Fig (3.13) View from point C in 500 m height from the surface, allowing some exaggeration to the plan for the third dimension. Here a slope in the site from south to north is noticeable (drawing by CAAD, Edinburgh University).

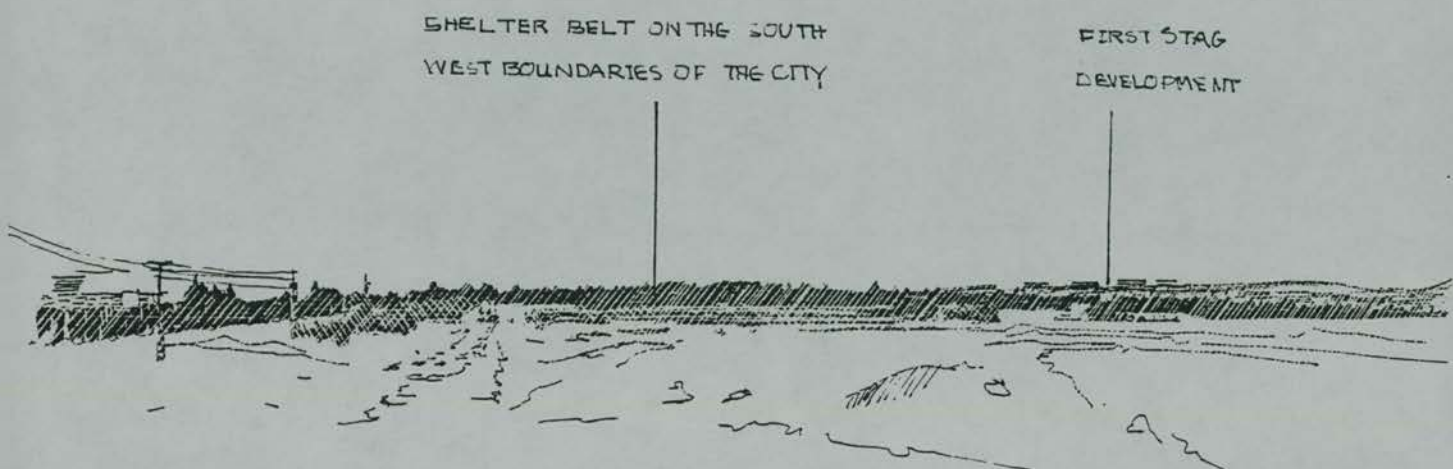


Fig (3.14) Shows the view from the highest point D in the south over the city. The site looks almost level. The proposed green area looks in small scale with the existing urban mass; in spite of this, it emphasizes the impression of the green area in the desert landscape (sketch by the author).



Fig (3.15) Shows the view from the main entrance at the south point F. There is no point of identity to the area – left side (Ficus nitida) right side (Delonx regia) (photo by the author).



orientation and the pattern of the urban mass of the new development. A site with less desirable natural features or views should be designed carefully with the intention of creating its own identity. The sense of the place of the new development seems that it does not recognise the culture of the people who come from different environments.

#### R.3.1.2 Landscape concept

The intention of landscape design in 10th of Ramadan (Main Report) was to provide a good environment for humans and at the same time to hold the city structure together and to increase the cohesion of its constituent parts. It was proposed that the landscape element should serve to collect dust, regulate the composition of the air, decrease noise, produce a pleasant outdoor environment, provide shelter from wind and screen off undesirable views.

The configuration of the main part of the city resembles a tulip flower. It consists of two equal halves on each side of the city centre strip, although it may be said to function virtually as a concentric city (Fig (3.16)). The landscape concept is based on the two parkways (400 m wide) which run through each side of the city, roughly corresponding to the arms of Wadi Garffa and parallel to the city centre (Fig (3.17)). The parkway design places great emphasis on soft landscape consisting of trees planted on great extended grass areas (Fig (3.18)). Other areas, by contrast, have been dominated by the structure of buildings with hard surfaces devoid of vegetation (Fig (3.19)). The main landscape concept will be examined briefly for the different areas of the city (residential, industrial, roads and public open areas).

#### **Residential areas**

The residential areas are built up on a hierarchy of residential groups forming neighbourhood units of about 4500 inhabitants (Fig (3.20)). Around eight neighbourhoods will then form a community of

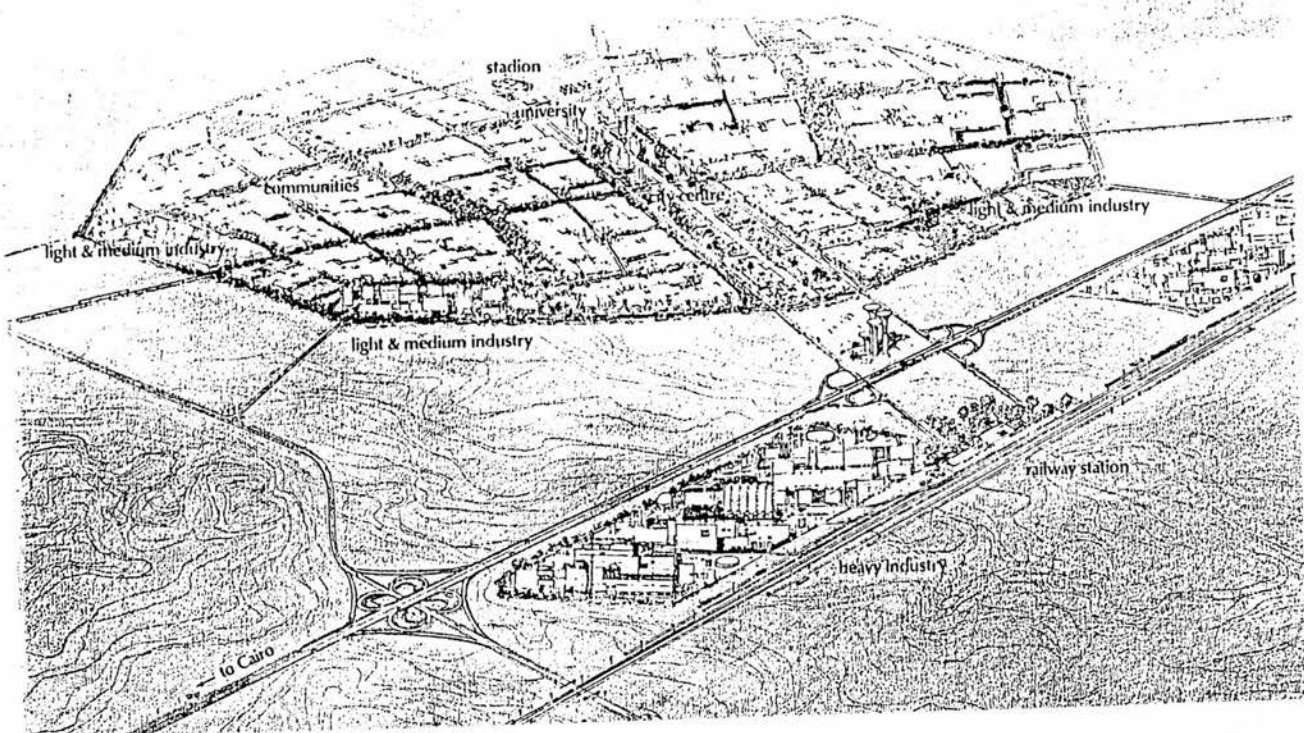


Fig (3.16) General view of 10th of Ramadan (SWECO Master Plan, 1976, p4).

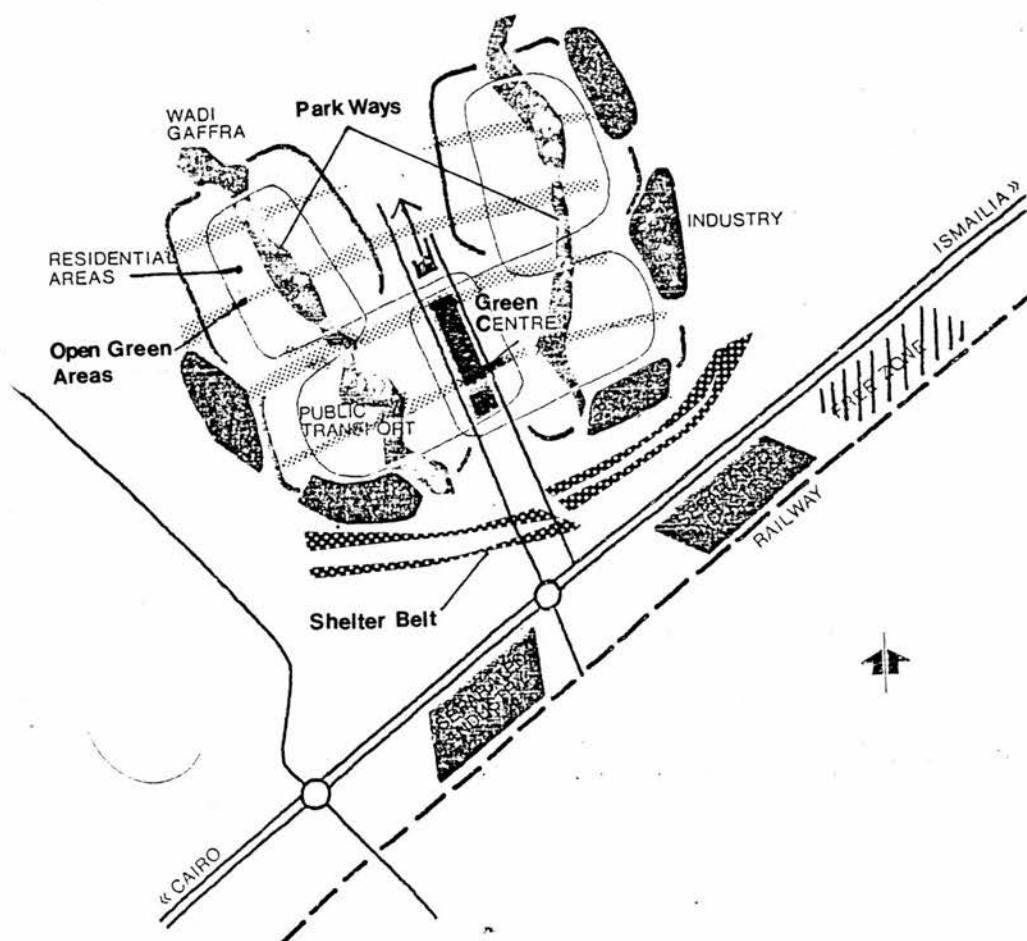


Fig (3.17) Basic landscape planning concept (SWECO Master Plan, 1976, p38).



Fig (3.18) A soft landscape of trees and shrubs planted in great extensive grass land (photo by the author).



Fig (3.19) Central area dominated by hard finishes (photo by the author).



30000 to 40000 inhabitants (Fig (3.21)). For each community there are four types of housing standards as shown in Table (3.5) (SWECO Master Plan, 1976, p90).

Table (3.5)

| Type of housing  | Share of dwelling units<br>% |
|------------------|------------------------------|
| Low-cost housing | 60                           |
| Middle level     | 36                           |
| Upper middle     | 3                            |
| High level       | 1                            |

The housing areas are always predominantly flat blocks consisting of four or five storeys. They have large surrounding areas of undefined function, with open spaces dominated by grassland. Small parks and play spaces have been designated within residential areas. Fig (3.22) shows a typical residential area of 10th of Ramadan. The proposed public green area (park, garden, playing field) at community level is 10 m<sup>2</sup>/inhabitant. Any visitor to the city would immediately notice that the city has a great deal of open space in the form of roads, parking areas and proposed green spaces [10].

### **Industrial areas**

The master plan separates industrial areas into three main types (separated, connected and integrated) (Fig (3.23)), considering size, density, environmental impact and transport demand. Great open spaces are found in the industrial areas in the form of spacious roads or outdoor storage areas. These large open areas are considered as sources of dust within and out of the site. There is no clear design for the areas. From the site observations, little effort has been made by individuals to plant trees along the fences of their factories (Fig (3.24)). The industrial areas are growing faster than the residential

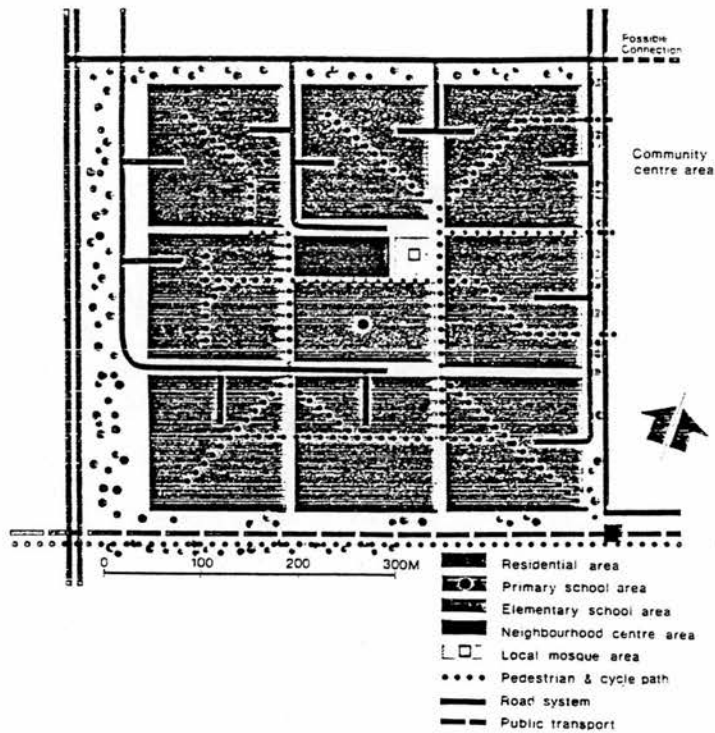


Fig (3.20) Neighbourhood - a principle layout (SWECO Master Plan, 1976, p56).

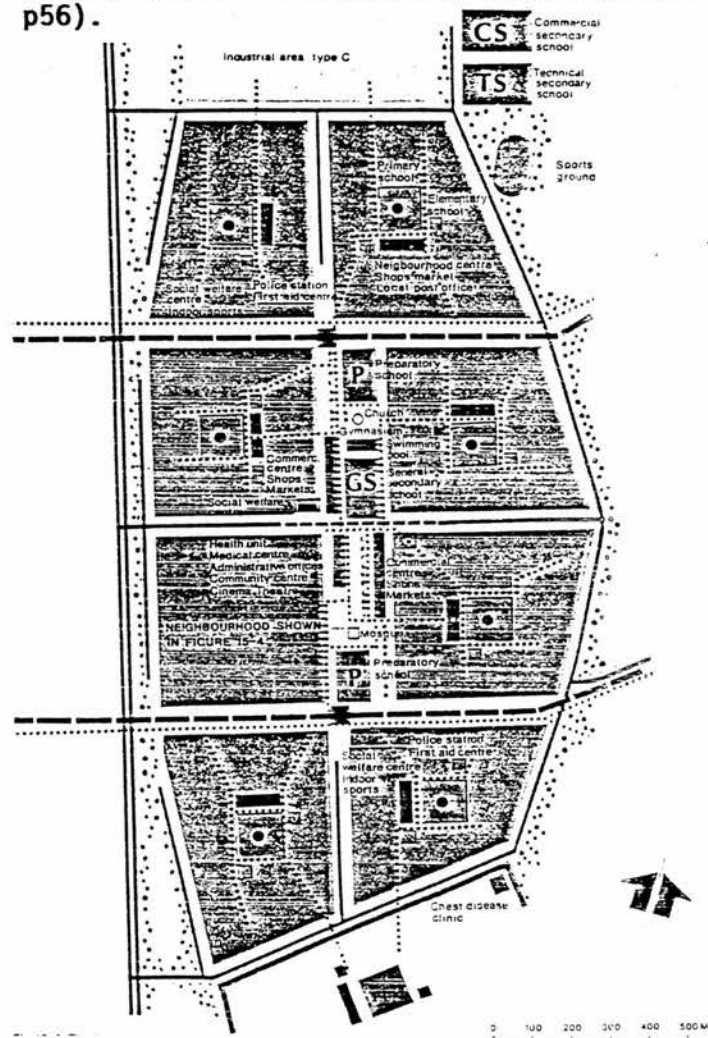
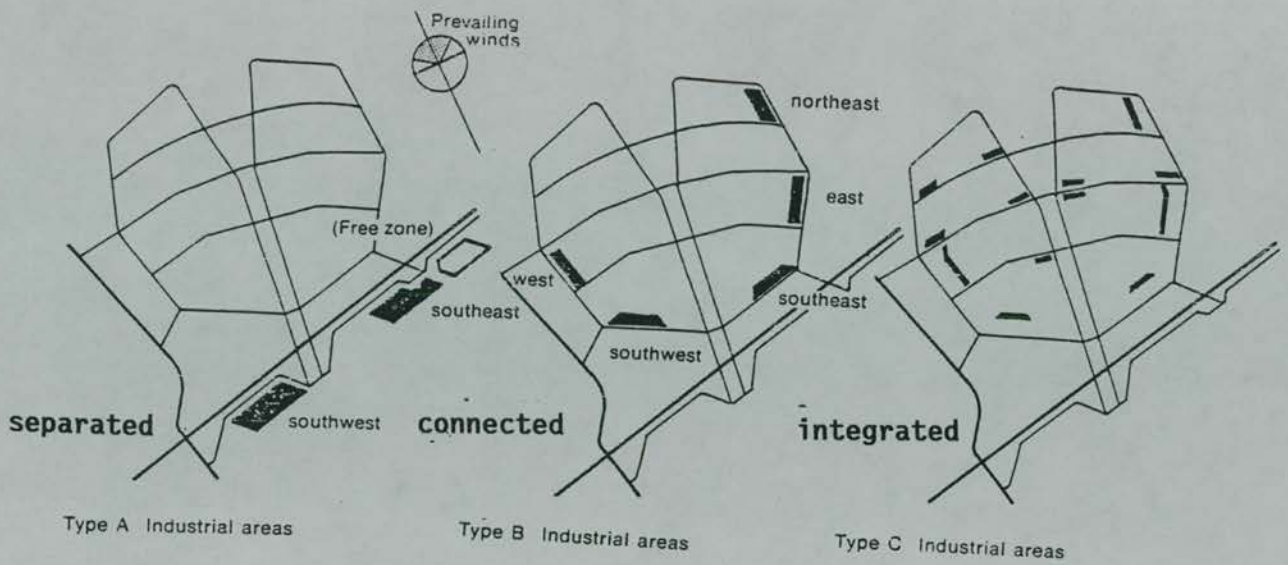


Fig (3.21) Community - with a principle system of facilities (SWECO Master Plan, 1976, p58).



Fig (3.22) A typical open space within a residential area—tracking area and litter are the common feature of these open spaces. (photo by the author).



**Fig (3.23) Industrial types of 10th of Ramadan (SWECO Master Plan, 1976, P40).**



**Fig (3.24) Landscape of the industrial area (M.C., 1987, p24).**

areas in the first stage of the development of 10th of Ramadan and yet with little or no attention apparent in their landscape design.

Any landscaping in industrial areas (especially desert areas) should be executed on a large scale, providing screening, shelter and enclosure. This requirement should be associated with industrial construction from the early stages to be effective. At 10th of Ramadan it is missing.

### **Roads**

Heavy traffic in the new town has been isolated by using an outer ring road with direct access from the main highways. Traffic through the residential communities and their neighbourhoods is kept to a minimum. Walking and cycling have been proposed for short distances and public transport for long distances. It has been proposed that public transport should be separated from pedestrians and cycles. Fig (3.25) shows the transport network.

Roads with asphalt surfaces are the dominating feature of the landscape of the new development area; they occupy 25% of the city area. A very large area of land set aside for roadside planting remains without any treatment. This contributes to the lack of individual sense of place within the city.

The detailed road landscape design is very poor. The master plan proposed that street trees be used mainly for separating the view from the desert and to provide a permanent, long and green vista. In reality, there is no difference in the degree of enclosure or openness for views from the vehicle (Fig 3.26). Fig (3.27) shows the use of deciduous trees which do not provide any degree of enclosure. Most of the footpaths are left without any trees to provide shade.

### **Public open space**

The central area occupies the middle part of the city with a huge



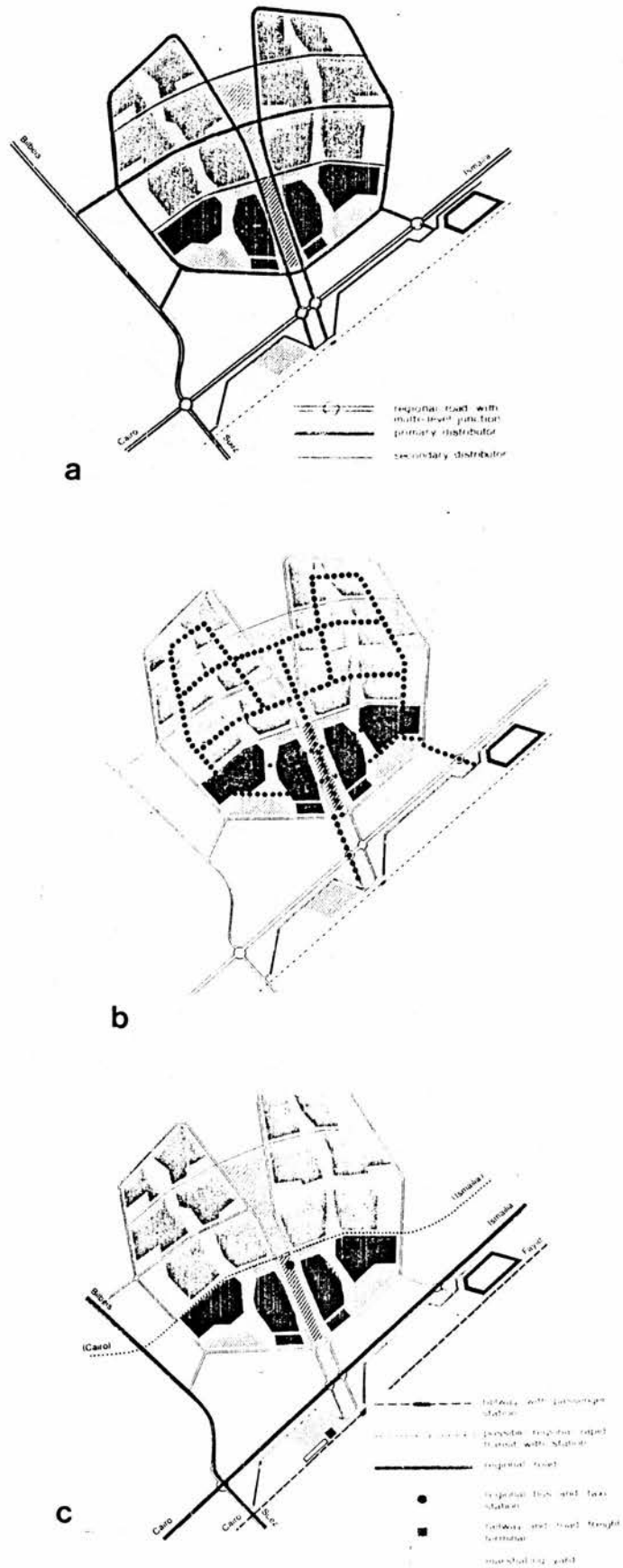


Fig (3.25) Transport network

- Road network
- Primary pedestrian and cycle paths
- Regional transport facilities

(SWECO Master Plan, p70, 74).





Fig (3.26) There is no isolation of buildings from the road sense (sketch by the author).

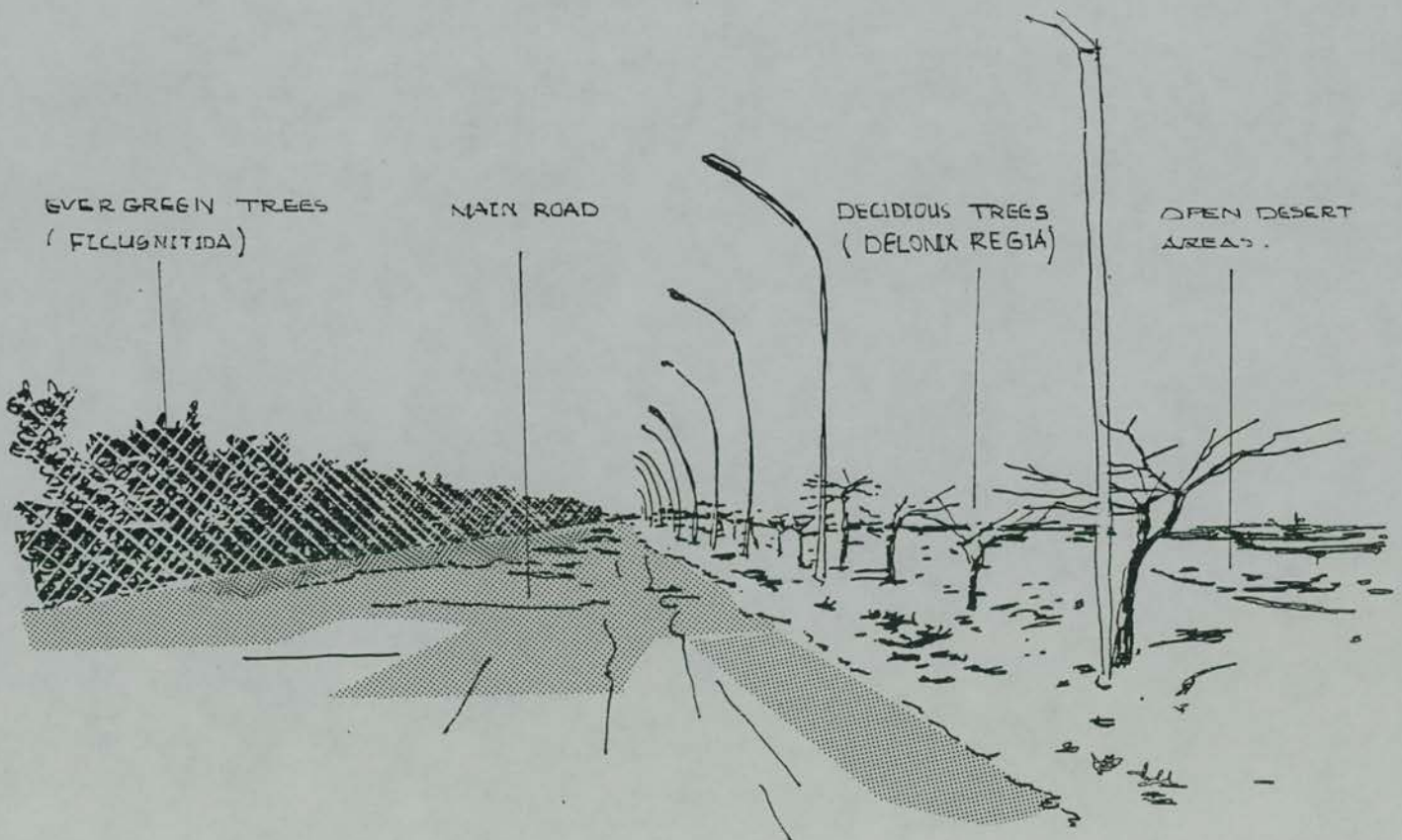


Fig (3.27) Unsuccessful planting of Delonx regia attempt to screen undesirable views (sketch by the author).

width ranging from 500-700 m. The width reaches 1000 m by adding the main roads to the total space. A central area on this scale has effect to provide the main channel to carry desert wind. This area contains the city centre and other specialised activities (offices, hospitals, shops, services, city park and stadiums) (Fig (3.28)).

The second main open space after the central area is the proposed two arms of Wadi Gaffra, which have been utilized as green areas (parkways). Each parkway crosses one side of the city from south to north with a width of 400 m. A cross-section of the proposed landscape design of the area is shown in Fig (3.29). These areas will be a main channel for the desert wind also (Fig (3.30)).

The city park is in the southern part of the city centre area (Fig (3.30) above). It should have been completed in 1984, but nothing was made until 1987.

It was recommended that, as far as possible, facilities for different kinds of recreational activities should be located in the residential areas; those serving the whole city would naturally be located in the central area (Fig (3.30) above). A site for a stadium has been provided on the northern part of the central area.

The main shelter belt was designed as two 25 metre wide belts with a distance of 200 metres between them on the south and south-west boundaries of the city. Fig (3.31) shows the plan and detailed design of the shelter belt. It is arranged with the highest trees in the middle and low compact shrubs on the sides. From the site observation, one row of the belt has been planted, but only Casuarina spp have been used to occupy the whole belt. A nursery project was proposed to provide the city with its plant requirements, but this did not start until 1987.

The pattern of further growth of the city was proposed to be in four stages as shown in Fig (3.32). The first stage of development of

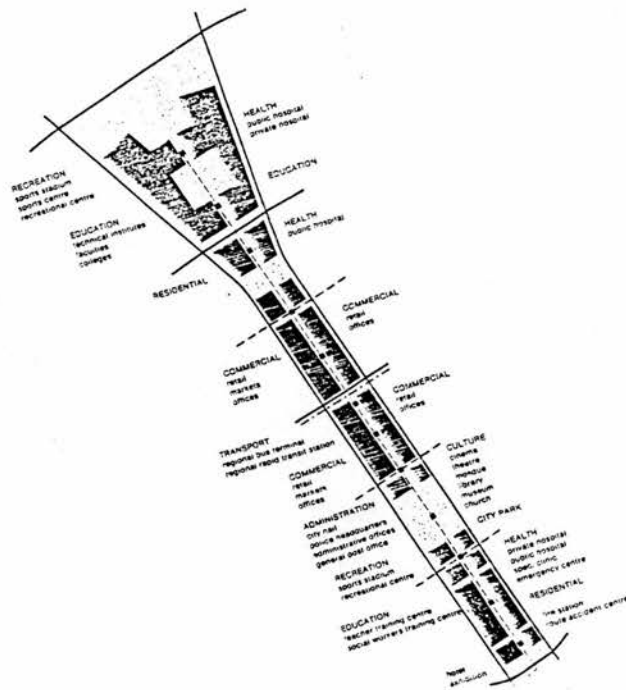


Fig (3.28) Central area (SWECO, 1976, p65).



Fig (3.29) Cross-section through the wadi area (SWECO, 1978, p8, 12).



Fig (3.30) Recreation and open space (SWECO, 1976, p30).

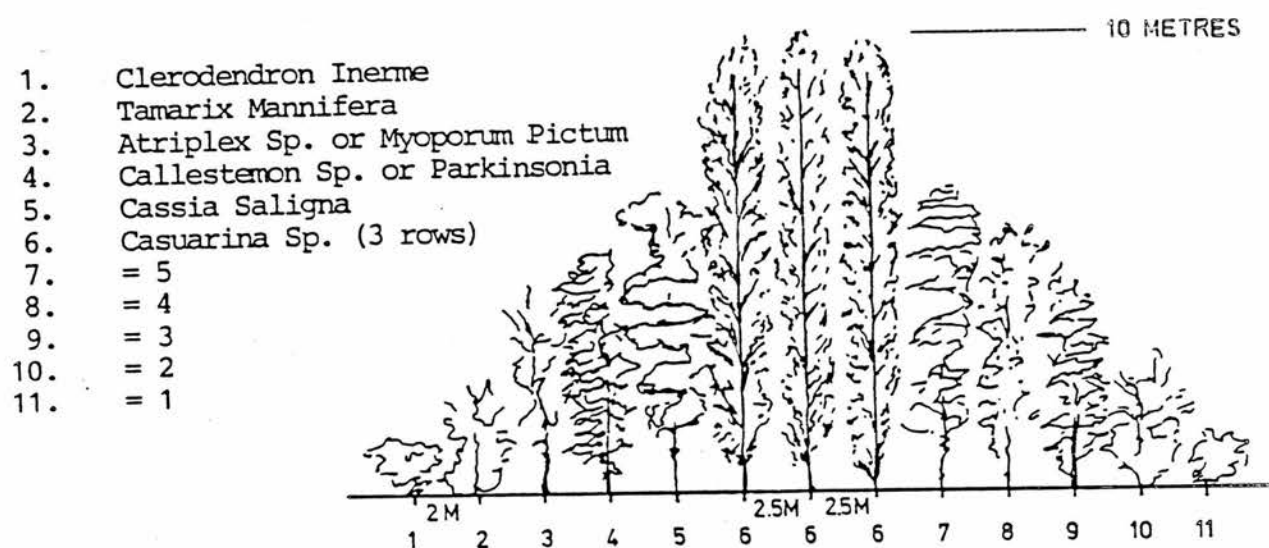
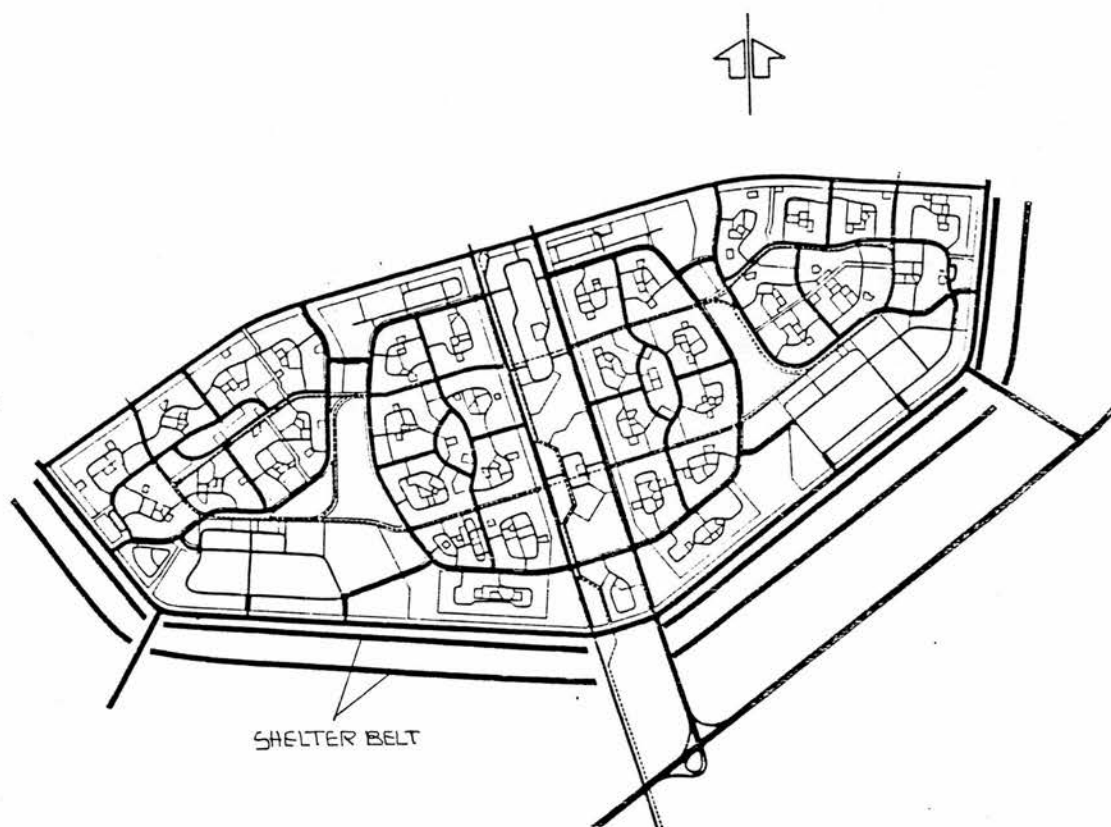


Fig (3.31) Plan and detailed design of the shelter belt (SWECO, 1978, p86 and 87).

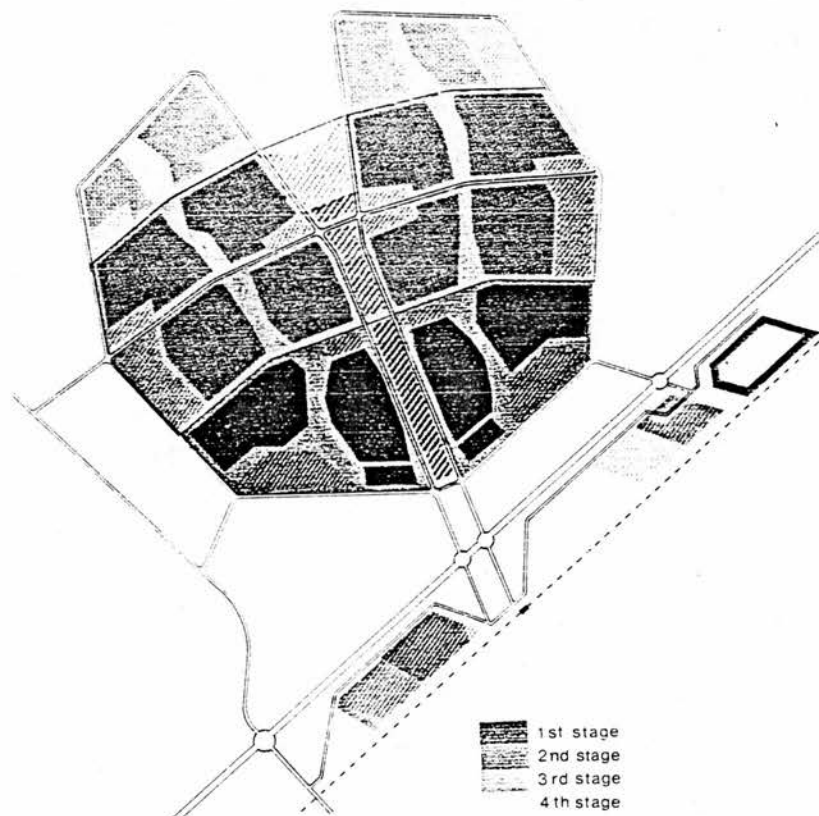


Fig (3.32) Staging of development (SWECO Master Plan, 1976, p42).

the city planned for a population of 150000. The construction of this stage started in 1980. There are shortcomings in housing areas and also in progress in the industrial areas. (As mentioned at the beginning of this chapter, the evaluation of the two case studies will be discussed after presentation of the Sadat city case study.)



## Case study II

### Sadat City

#### S.3.1 LANDSCAPE FEATURE OF SADAT CITY

##### S.3.1.1 Site assessment

###### a) Socioeconomic data

Sadat city is the second independent new city to be built, after the 10th of Ramadan city. The construction of the city started in 1980. It was planned as a self-sufficient independent city with a mixed economic base, largely industrial, but supplemented by a central government and ministerial presence and a university. The city is situated about 2-3 km east of the Cairo-Alexandria desert road, approximately 95 km north of Cairo (Fig (3.33)). It is located on desert land owned by the government and has no other potential use. One-third of the nation's population is now within an hour's drive of the Sadat city's location.

Sadat city is part of a national development strategy to save agricultural land in order to further the nation's economic growth and to provide at least 165000 jobs and housing away from the overcrowded cities of Cairo and Alexandria. The city is expected to have a population of at least 500000 after 25 years and is planned to physically expand to accommodate a population of up to 1.5 million within 50 years. Most of the population at this stage will come as immigrants from the surrounding area.

Ample land is available, as only 5000 hectares of the 30000 hectare tract are projected for use at a population level of 500000. The land use analysis is illustrated in Table (3.6) (Sabbour, 1980, p6:5).

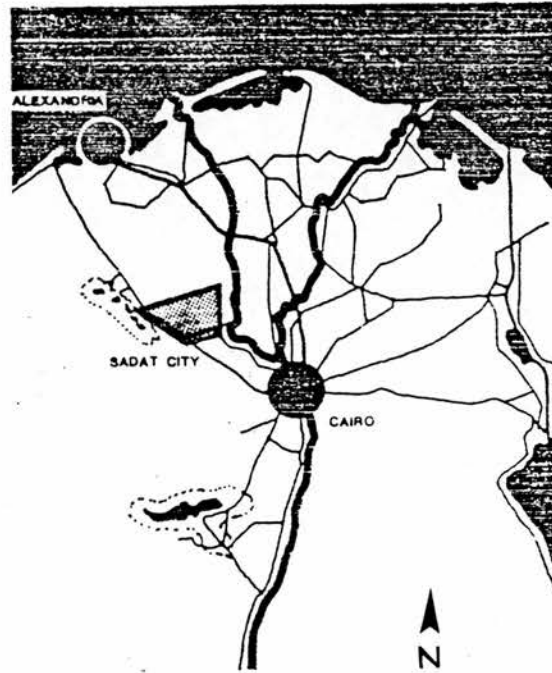


Fig (3.33) Site of Sadat city (Sabour, 1980, p1:1).

Table (3.6)

|                           | %  | ha   |
|---------------------------|----|------|
| Residential               | 50 | 6250 |
| Industrial                | 10 | 1250 |
| Services                  | 11 | 1370 |
| Green area and recreation | 15 | 1875 |
| Roads                     | 12 | 1500 |
| Public                    | 2  | 250  |

The Sadat city site is situated in a very large section of desert, bordered on several sides by agricultural land and desert land. The major agricultural area is the Southern Tahrir project. This was begun in 1953 and finished in 1967, covering 45000 feddans. There are, in addition, two minor agricultural developments, one at Wadi El Natrun and another alongside the Cairo-Alexandria road (Fig (3.34)).

The only historical area in the vicinity of Sadat city is Wadi El Natrun. This is a lowland depression 23 m below sea level, 5-20 km wide and 160 km long, lying west of the Sadat site (Fig (3.35)). Three decades ago the area of the wadi was covered by 16 large and small salt lakes fed by a subterranean water supply through a layer of gravel from the Nile. Nowadays, the ground water stream from the Nile is diverted and used for irrigation before discharging into the lakes. Wadi el Natrun has been converted into an oasis with a dense population [11]. North of the wadi, an historic monastery (Deir) is to be found. The Deir was built in 300 A.D. to house Christians fleeing from Roman persecution. This monastery attracts many tourists to the area. The name of the city has a political connotation as it refers to the last president of Egypt, Anwar El Sadat. The original name for the area has been ignored completely.

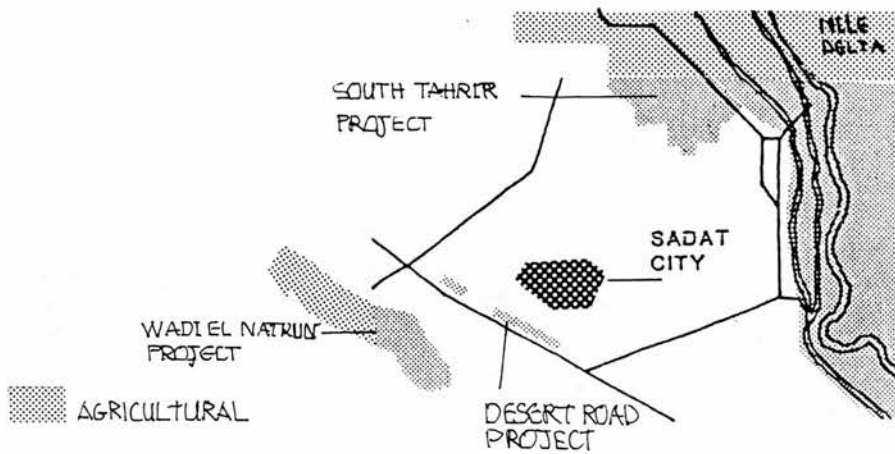


Fig (3.34) Agricultural area within the site (Sabour, 1980, p4:3)

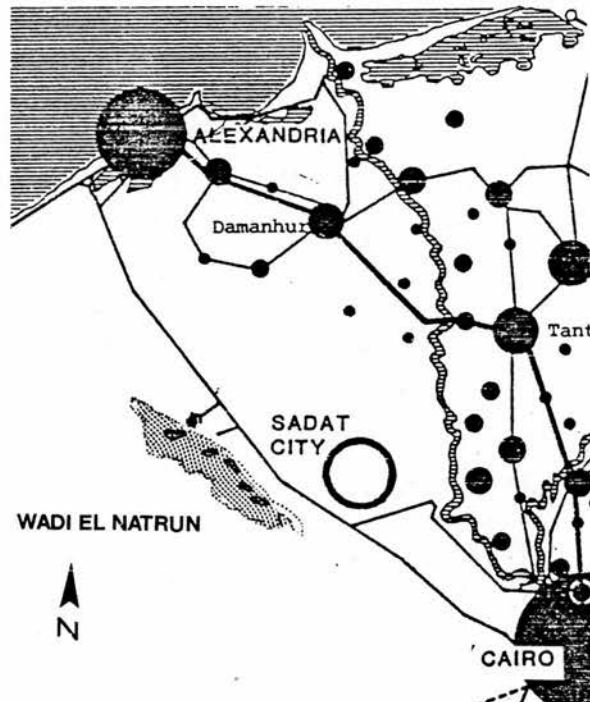


Fig (3.35) Wadi El Natrun is the most remarkable area near the city especially with its historical monastery dating from 300 A.D. in the north part (Hyland, Housing in Egypt, 1986, p82).

## b) Landscape and its ecological factors

### **Geology and topography**

Recent deep drilling in the Sadat city desert area has shown that this apparently simple geological structure, made by the thin cover of later sediments, concedes beneath it an intricate geological structure composed of a large number of swells and basins. The surface of the site is of aeolian origin (i.e. geologically wind-deposited), and a high proportion of desert pavement is gravel surface.

The ground elevations above mean sea level vary from 70 meters in the south-west to approximately 20 meters in the north-east (Fig (3.36)). The city itself is located in a relatively flat area without any significant drainage apart from a few small wadis. The landscape is dominated by a desert of sand and rocks and is subject to a long season of sandstorms. The storms which do occur are typical desert area storms of high intensity and short duration. Rain storms can produce runoff frequently sufficient to justify a collection system to divert storm water from urban areas.

### **Hydrology**

At present the main water supply is dependent on the local aquifer, estimated to be 3000 m thick. It is recharged from surface water courses in the Delta (River Nile channels).

Urban water is to be supplied initially from wells which are located to the south-east, in order to obtain the best quality of water. A daily pumping rate of 40000 cubic meters was planned. The major elements of the water supply system are shown in Fig (3.37) for a city of 500000 people.

The nearest surface water is the Rosetta Branch of the Nile and Beharry Canal which is about 25 km east of the planned city. The site is considerably higher than the level of the Nile and potential surface

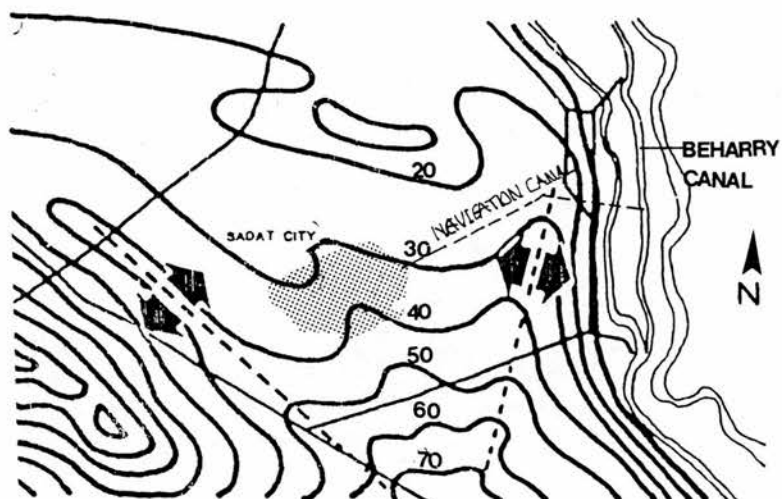


Fig (3.36) The slopes of the Sadat area. The city itself is located in a relatively flat area (Sabour, 1980, p4:6).

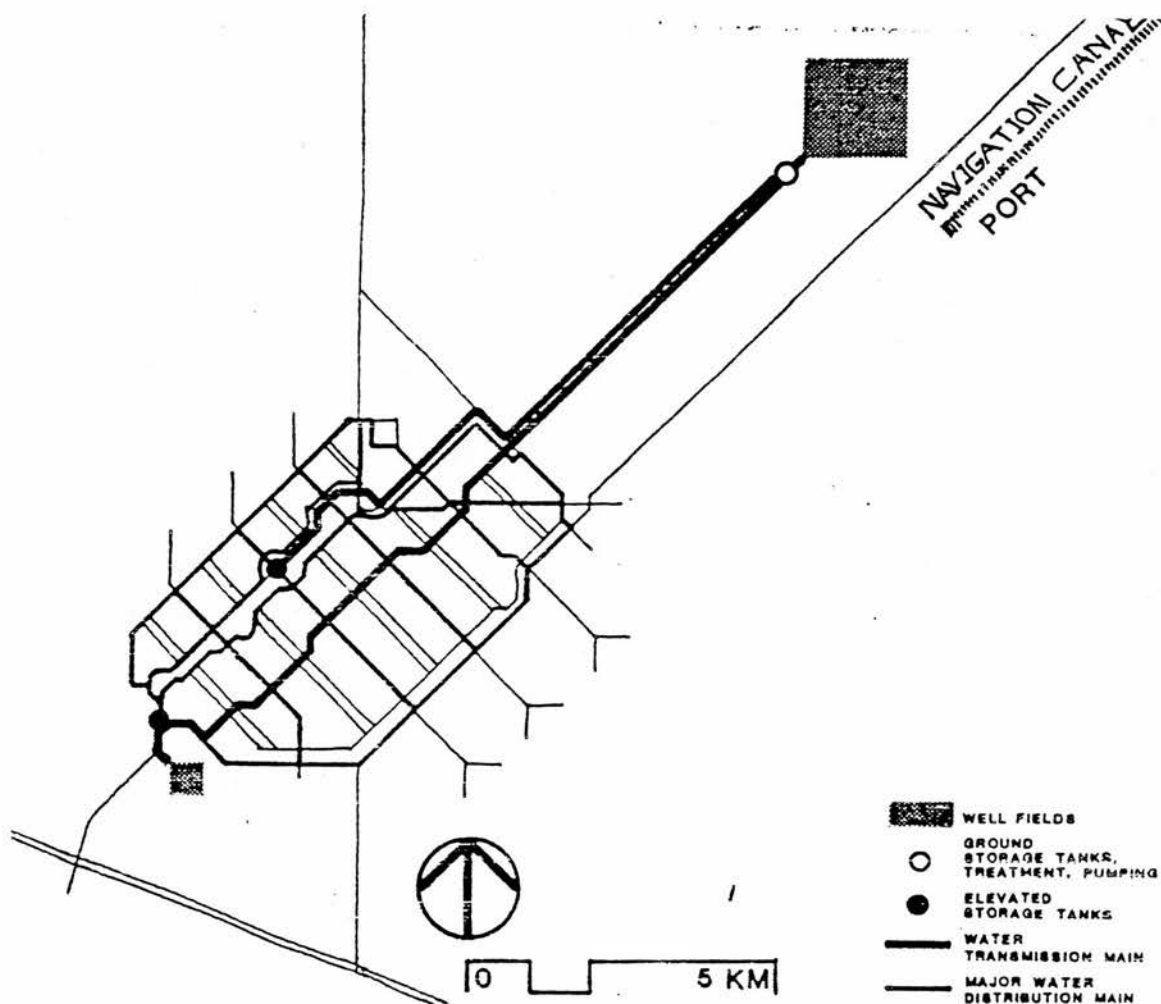


Fig (3.37) Water supply system for Sadat city (Sabour, 1980, p3:36).



irrigation canals could not be provided, except in the south-eastern part where a navigation canal will eventually be constructed to service a steel mill project (Fig (3.37) above). It was proposed to use aerobically-treated waste water for shelter belt irrigation with waste water from sinks and showers used for courtyard garden irrigation.

Water from rainfall is a minor resource, the average annual rainfall being 57 mm, but storms of high intensity and short duration may occur. The total average water demand for industrial, domestic and irrigation use is estimated from different resources (Table (3.7) a,b,c).

|  |  |  |  |  |  | TYPE OF INDUSTRY       |  | DAILY WATER CONSUMPTION (LITERS/EMPLOYEE) |                           |                   |                                |
|--|--|--|--|--|--|------------------------|--|---|---------------------------|-------------------|--------------------------------|
|  |  |  |  |  |  | STEEL                  |  | 11,700                                    | TREATMENT PLANT           | POPULATION SERVED | CAPACITY (M <sup>3</sup> /DAY) |
|  |  |  |  |  |  | HEAVY POLLUTIVE TYPE 1 |  | 1,050                                     | I                         | 40,000            | 6,000                          |
|  |  |  |  |  |  | NONPOLLUTIVE TYPE 2    |  | 770                                       | II                        | 100,000           | 12,000                         |
|  |  |  |  |  |  | NONPOLLUTIVE TYPE 3    |  | 590                                       | III                       | 130,000           | 18,000                         |
|  |  |  |  |  |  | NONPOLLUTIVE TYPE 4    |  | 180                                       | IV                        | 250,000           | 36,000                         |
|  |  |  |  |  |  | NONPOLLUTIVE TYPE 5    |  | 50  | V & VI                    | —                 | 8,000                          |
|  |  |  |  |  |  |                        |  |   | STEEL & TYPE I INDUSTRIES | —                 | 43,000                         |
|  |  |  |  |  |  |                        |  |   | TOTAL                     | 500,000           | 123,000                        |

| YEAR                       |    |     |     |     |     |
|----------------------------|----|-----|-----|-----|-----|
| 5                          | 10 | 15  | 20  | 25  |     |
| POPULATION (000)           | 61 | 147 | 251 | 361 | 500 |
| AVERAGE DAILY DEMAND (000) | 19 | 71  | 105 | 176 | 228 |
| PEAK DAY DEMAND (000)      | 29 | 102 | 146 | 231 | 286 |

Tables (3.7) a,b,c Anticipated water demand for the city.

- a) Domestic water demand.
- b) Industrial water consumption.
- c) Sewage treatment plant capacities.

(Sabour, 1980, p5:37, 15:37, 15:83)

## Soil

The FAO undertook a soil survey in 1963 of the uncultivated lands adjoining the Nile. The results for the area in the vicinity of Sadat City are shown in (Fig (3.38)). It can be seen that the soil is generally poor and not conducive to agricultural development on a large scale. Class IV soils which dominate a great part of the site are suitable only under special conditions. There are extensive areas of

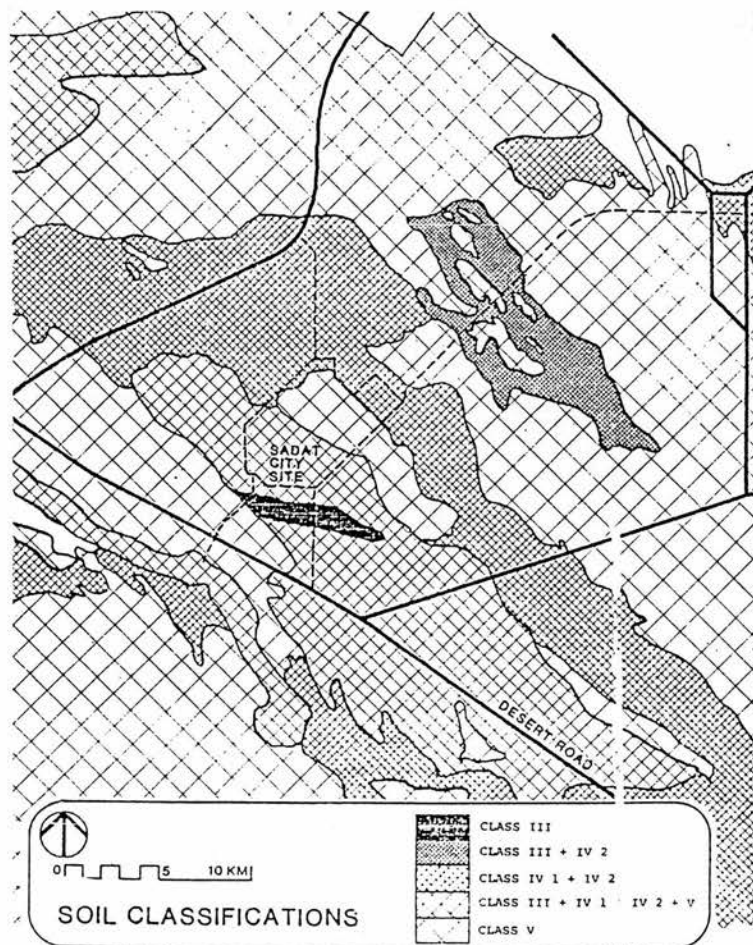


Fig (3.38) Soil classification of Sadat city area and around (Sabour, 1980, p2:6).

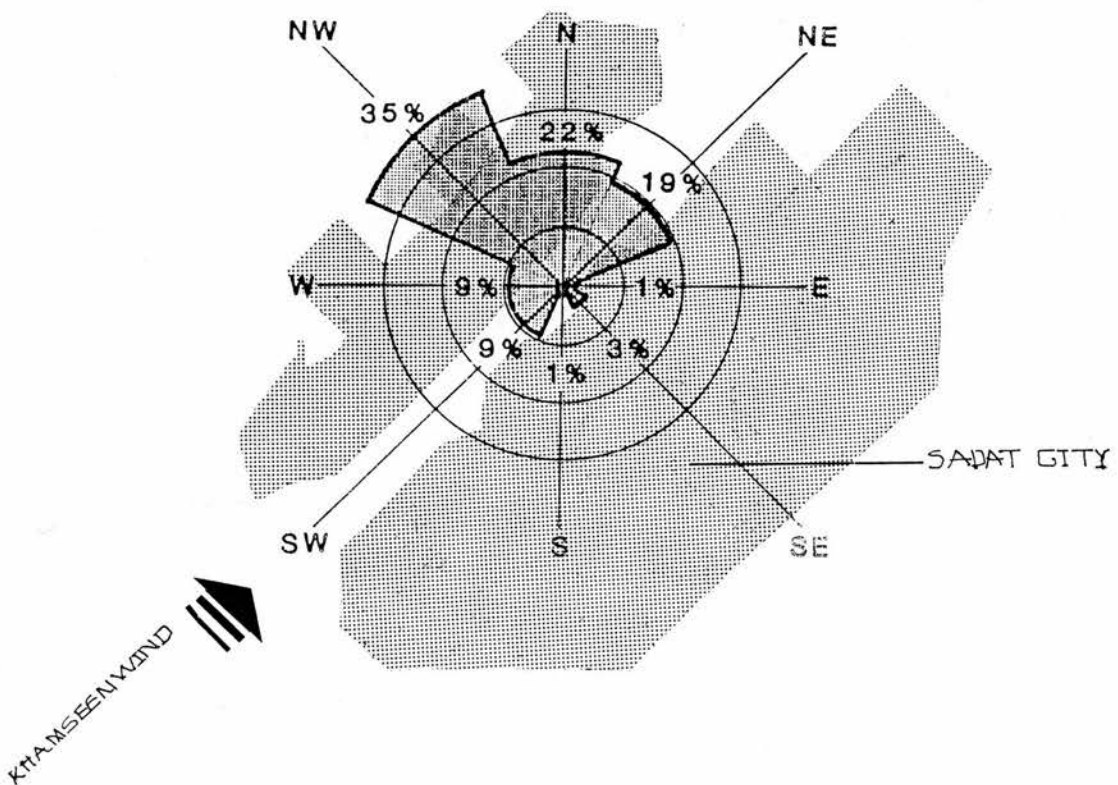


Fig (3.39) Wind directions: average annual (Sabour, 1980, P5:48).

Class V soils which require special soil amelioration practices. On site, top soils are predominantly sand and gravel with small areas having traces of silt or lenses of silty clay. In general, maintaining green areas will not be an easy task with this type of soil and salinity is the most critical problem.

### **Climate**

The climatological conditions at the site could be described as arid. Rain is scarce and unreliable, averaging about 57 mm/year and unable to support the development of wild vegetation. Nearly 80% occurs in the four months between November and February. However, it can be torrential causing a water storm.

The average annual mean temperature is 22°C and mean daily temperatures vary throughout the year. The lowest temperature is 7°C in January and the highest is 57°C in June and July. The highest rates of evaporation occur from May to August. This emphasises the importance of a climatic design.

The prevailing wind is from the north and north-west and is cool and rainy in winter. The second wind to be considered is a south-westerly one (Khamaseen), which is often strong enough to cause sand storms. The wind direction is illustrated in Fig (3.39). The area as a whole is subjected to sand storms and the planned shelter belt is not enough to protect the city.

### **Plant and wild life**

Grazing by camels and desert sheep in the western section of the site, from a bare area located within Wadi El Natrun, has a great effect on the wild vegetation of the site. Fig (3.40) illustrates some camels grazing in the Sadat City area. Natural vegetation is sparse and consists of intermittent areas of scrub brush located along the natural drainage courses. Fig (3.41) shows some of the natural vegetation which



Fig (3.40) Camels graze in Sadat city area. The overgrazing of animals based in Wadi El Natrun has a great effect on the wild vegetation of the area.



Fig (3.41) Some of the wild shrubs growing in the central reservation area on the desert road near Sadat city (Salicornia spp., Tamarix spp., Zilla spp. and Zygophylen spp.).

has grown around the desert road near Sadat city when a sufficient amount of salt is leached and water is provided. Salicornia spp., Tamaria spp., Zilla sp. and Zygophyllum spp. are grown there.

The site is devoid of animal life with the exception of insects, desert rodents and migratory birds. The main reason for this is that the area has been disrupted by man, especially gravel mining operations.

### **C) Visual appearance**

An assessment of the important views (in and out) of the site has been made as follows:-

#### Views out of the area:

There are no remarkable views around the city. The desert plain provides the main visual feature of the landscape in and around the site (Fig (3.42), Fig (3.43)).

#### Views into the area:

The site could be seen from a great distance as a result of the landform around the area. The site looks the same, there being no difference between the different sections of the city. The desert plain dominates the landscape (Fig (3.44), Fig (3.45)).

#### **S.3.1.2 Landscape concept**

The existing natural landscape feature is a direct response to both the character and limitations imposed by the natural condition of the site being a harsh desert environment. The level landform seems to have a great influence on the landscape pattern of the city.

The main goal of the landscape design in Sadat city, as it was mentioned in the main report, was to minimize the adverse environmental impact within the city structure. It was proposed that the landscape element will be emphasized to enhance the environment, reduce pollution, create a protective and productive green belt and provide visual amenity.



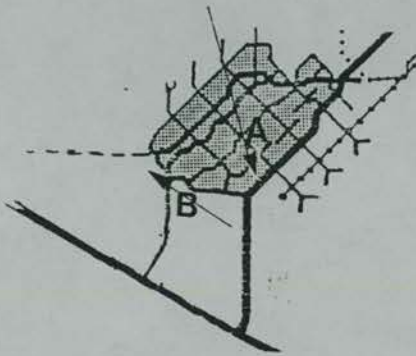


Fig (3.42) Shows the view from point A out south-westwards. The landform features look level and appear quite open and expansive. A high line electric power cable runs along the east and west side (sketch by the author).

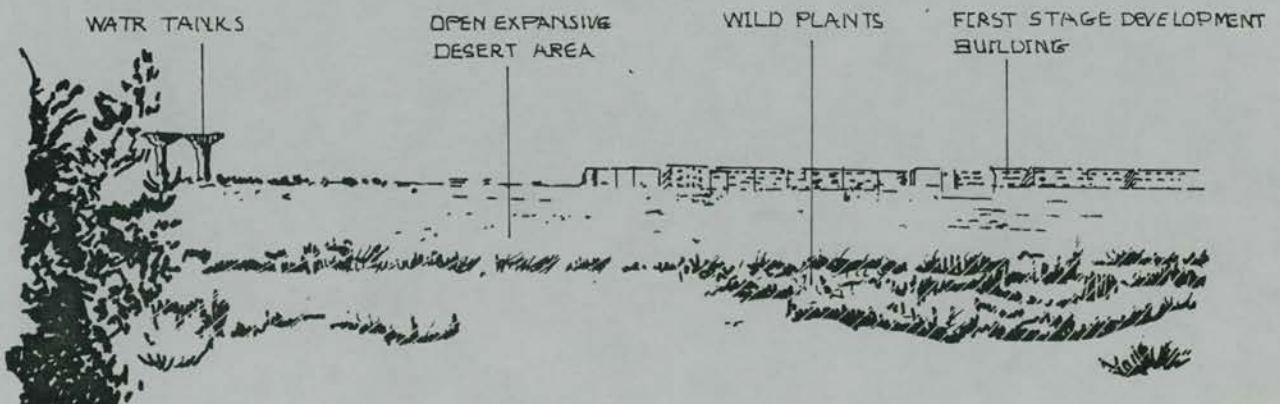


Fig (3.43) View from point B eastwards. The five-storey buildings of the first stage development defined the skyline in horizontal lines and are somewhat in harmony with the level desert site. The skyline is contrasted by two tall vertical water tanks which appear out of place. The large spaces that have been left between the neighbourhoods for green areas remain uncultivated. The introduced the feeling of desert within the urban area (sketch by the author).



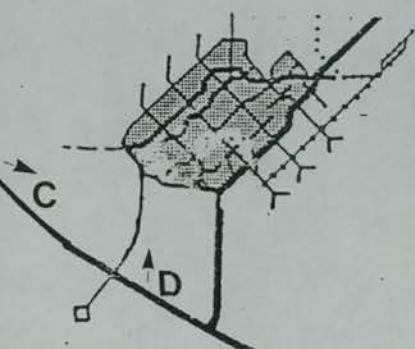


Fig (3.44) View into the site from north to south, point C desert road. The city appears as loose and smaller parts of the whole scenery, which is dominated by plain desert and bright sky (photo by the author).

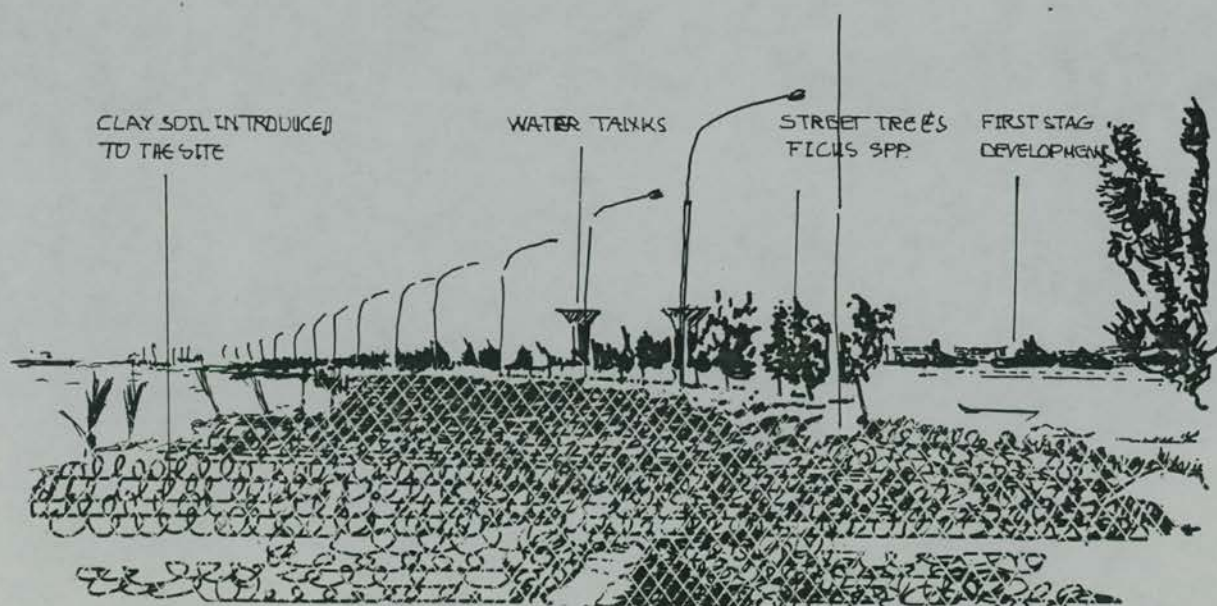


Fig (3.45) View into the site from the main entrance to the city, point D. The city has been approached with two elevated water tanks. *Ficus* spp. trees have been used to create a green vista along the main road. The clay soil has been spread over the side of roads to be cultivated with grass (sketch by the author).

The urban mass resembles a parallelogram with an extension reaching towards the port (Fig (3.46)). The urban area is about 4.5 km wide, spreads over a ridge immediately east of an existing high tension line and extends in a north-easterly direction for about 7.5 km. The potential port is placed some 8 km beyond the urban area.

The main landscape concept was proposed to provide a lush green, protective shelter belt to protect the city from the south-westerly Khamaseen winds. The shelter is placed at the western edge of the urbanized area. The south-westerly Khamaseen winds and the orientation of the city are the major factors which have shaped the general form of the city. The urban area facing south-west was minimized and connected closely with the protective shelter belt, while at the same time the urban area was opened to the north and north-west to catch the cooling north-west wind and provide maximum shade.

A series of green spines penetrate the urban mass parallel to the edge of the parallelogram shape. The centre spine traverses the urban mass from south-west to north-east and is linked with 16 district spines oriented north-west to south-east.

From the site observation through the first stage of landscape construction, it is found that a conventional highly irrigated landscape concept, with tree planting in random patterns, dominates the landscape concept within the open space of the city. The main landscape concept will be examined briefly as follows:

#### **Residential areas**

Residential areas are planned in close proximity to service and industrial facilities and are organised into a simple, clear series of spines linked together by a circulation system which provides separate routes for pedestrians, public transport and private vehicles. Fig (3.47) provides an example of a typical residential planning area.

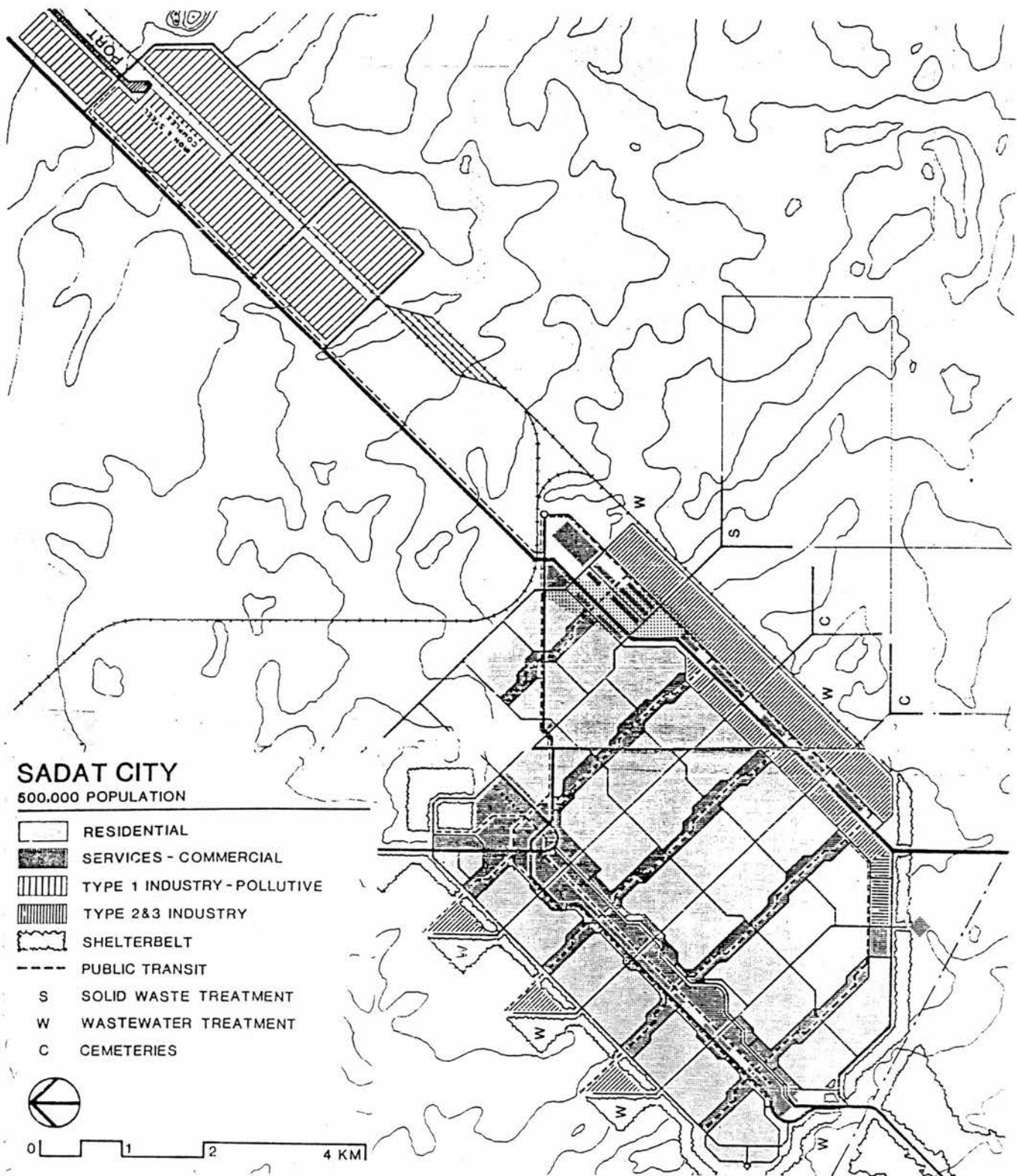


Fig (3.46) Master plan of Sadat city and its landscape concept (Sabour, 1980, p0:6).



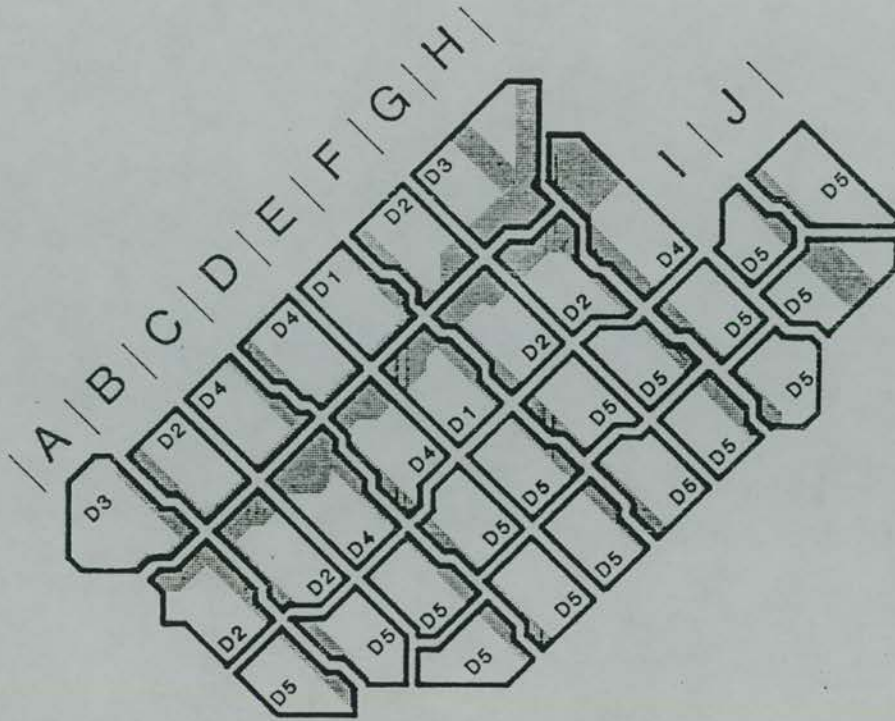


Fig (3.47) Residential planning areas (Sabour, 1980, p5:20).



Fig (3.48) Residential open space in large scale. The grass concept dominates the design (photo by the author).

There are five different areas of density levels ( $D_1$ - $D_5$ ) from high to light.

In general, the residential landscape area which requires to be traversed by pedestrians, was designed to provide enormous spaces with no relation whatsoever to clear concept. This situation is found in large and small open spaces in residential areas. Fig (3.48) and Fig (3.49) illustrates some examples of the different scales of grass concept which dominate the town. These areas were intended to be green but unfortunately have been left dry, dusty and without vegetation.

### **Industrial areas**

The industrial spine was located downwind of the main city, to minimise air pollution. Industry was classified according to its locational characteristics as shown in Fig (3.50).

Buffer zones were proposed to protect residential and commercial zones from air and noise pollution from the different types of industrial area.

### **Roads**

Almost two-thirds of all trips are estimated to be made by public transport, while walking and bicycles account for one-third. Public transit systems and the street system plan are illustrated in Fig (3.51).

The design for the roads is somewhat better than the 10th of Ramadan, occupying 12% (10th of Ramadan - 25%). However, a great width was created on the right of roadways. It was recommended in the main report that the right of the road should be increased as a buffer to reduce pollution. Unfortunately, these areas were left without any treatment, and they became a source of dust and pollution (Fig (3.52)).

At neighbourhood level, small static beds intended to be planted or grassed were built at the side of the streets, but these beds in fact



Fig (3.49) Small open space proposed to be covered by grass (photo by the author).

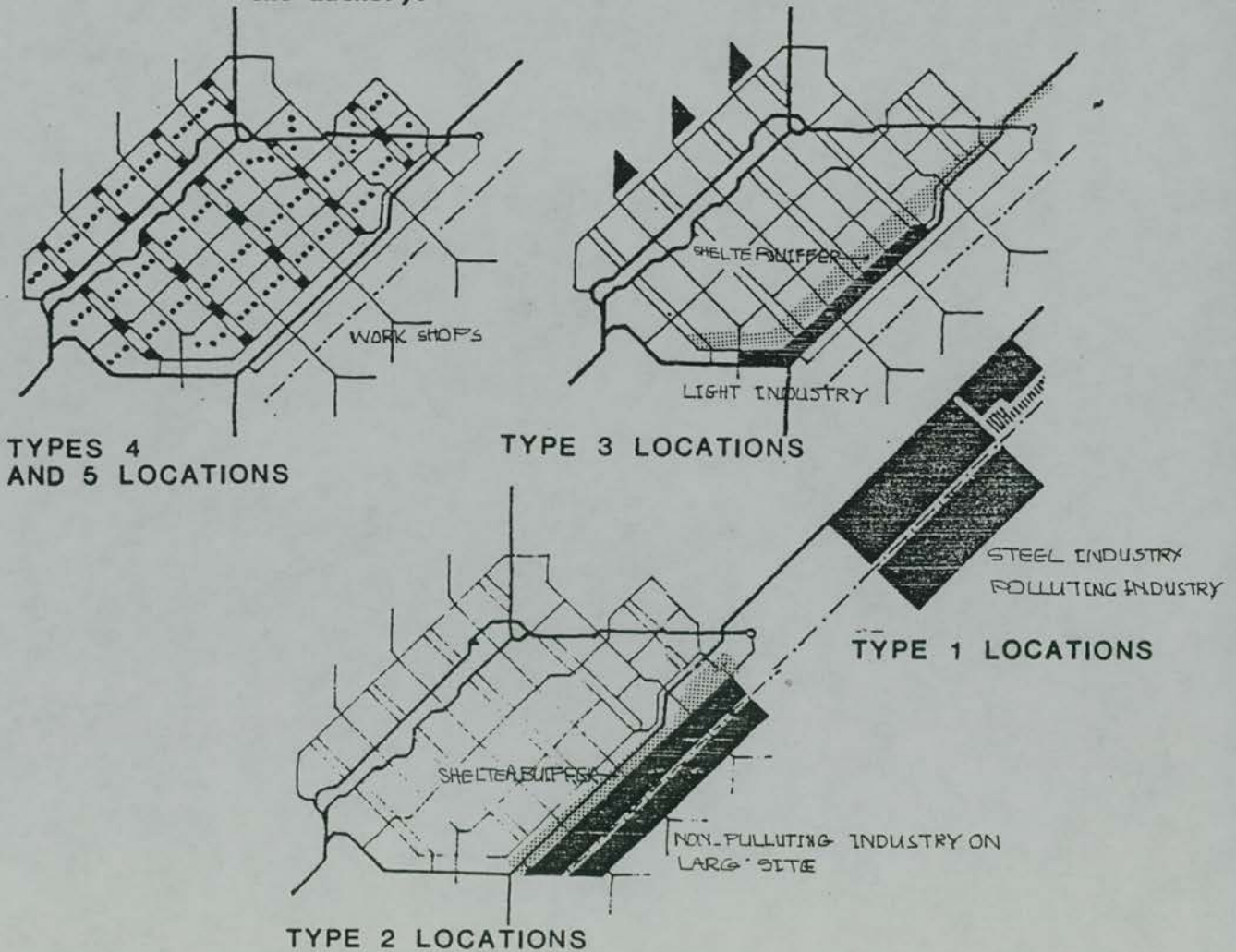


Fig (3.50) Industrial area types and location (Sabour, 1980, p2:16, p2:17).



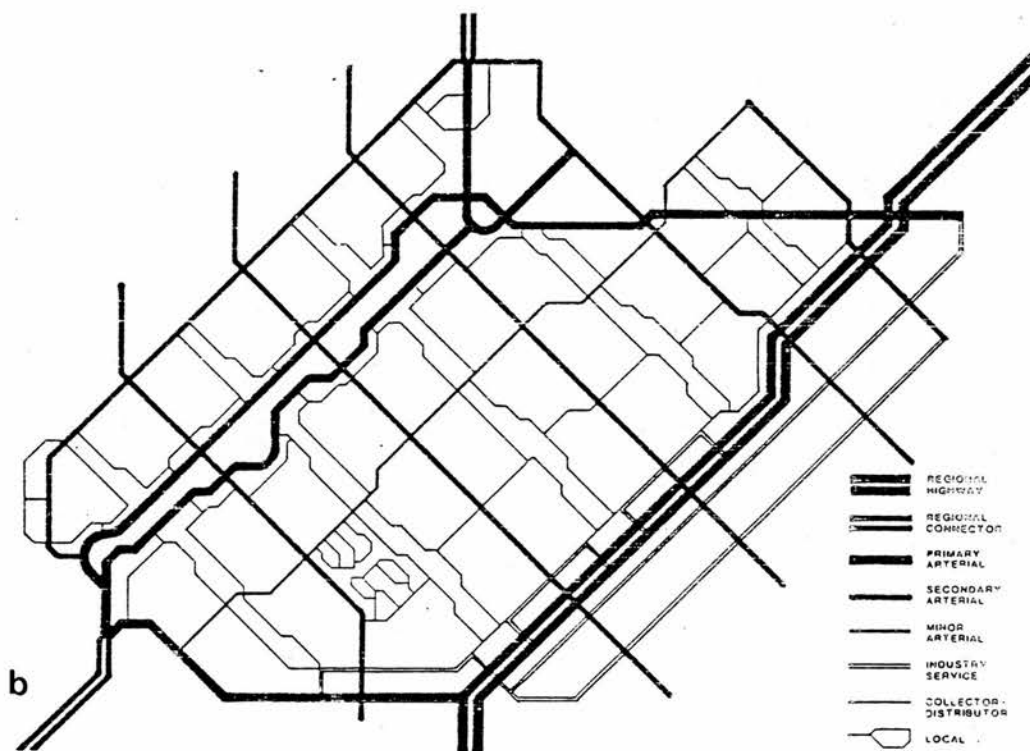
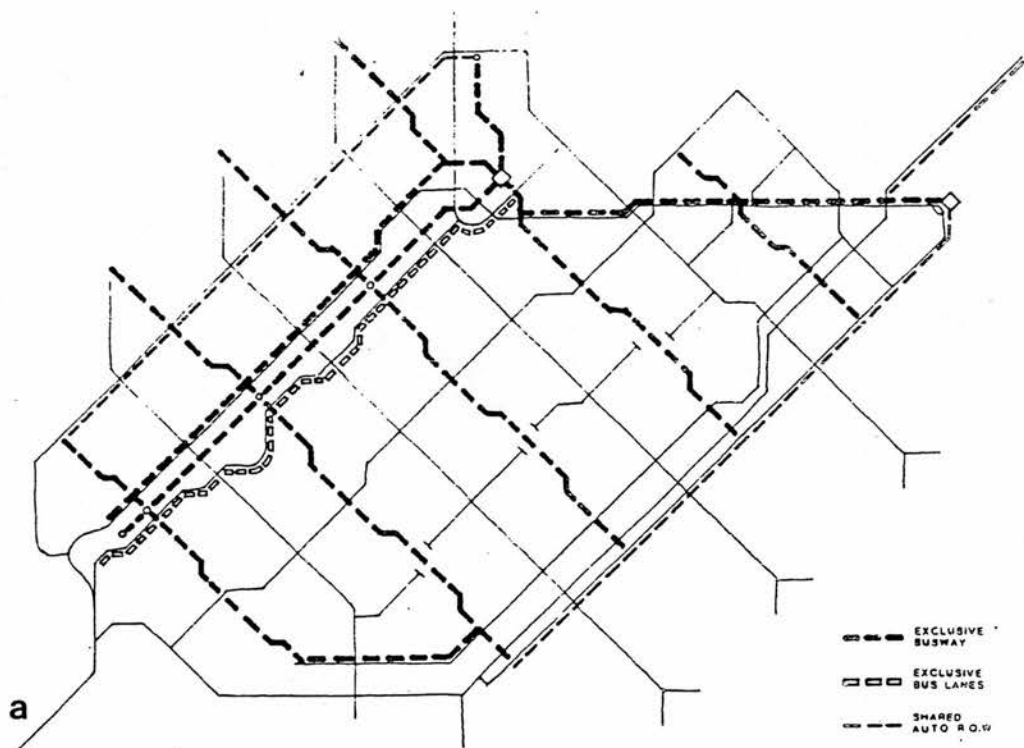


Fig (3.51) Public transit system plan (a) and street system plan (Sbabou, 1980, 5-30 & 5-37).



Fig (3.52) One of the main roads in Sadat city. The area beside the road has been left unplanted and become a source of dust (photo by the author).



Fig (3.53) Neighbourhood street with its side beds which are dry and not easily maintained (photo by the author)

were left dry and sandy because they were too small to be maintained (Fig (3.53)).

### **Public open space**

The hierarchy of open space is organized geographically into three types of spines. The central spine which includes the two sector central spine including the two sector centres as well as all facilities allocated to the city centre. The district spines (16) are linked with the central spine. The neighbourhood spines are linked with the district spines. Fig (3.54) shows the hierarchy of the spines system. Most of these areas are intended to be covered by a conventional landscape concept of grassy areas and individual tree planting.

A series of formal public gardens is proposed within the city open spaces. Fig (3.55) shows one of these parks in the central spine area in front of the Ministries building. A great deal of grass area was made. A bandstand was been located in the middle of the park, but the problem is that no-one could sit in the desert sun to listen to the music. It is a completely western park design.

The main shelter belt area was proposed to be sited on the western edge of the urbanized area to protect the city from the south-westerly Khamaseen wind (Fig (3.46) above and Fig 3.56)).

The first part of the shelter belt was proposed to contain a sand-catching berm, constructed from the local gravel on the site (Fig (3.57)). It is believed that this permanent forward berm up-wind of shelter belt planting could capture a very high proportion of the drifting sand before it enters the tree belt. The second part would contain rows of tall trees followed by an area 100 meters deep covered by orchard trees.

Modified shelter belts, without sand dunes or agricultural green belts, occur along the south-east industrial spine as 10 meter wide wind

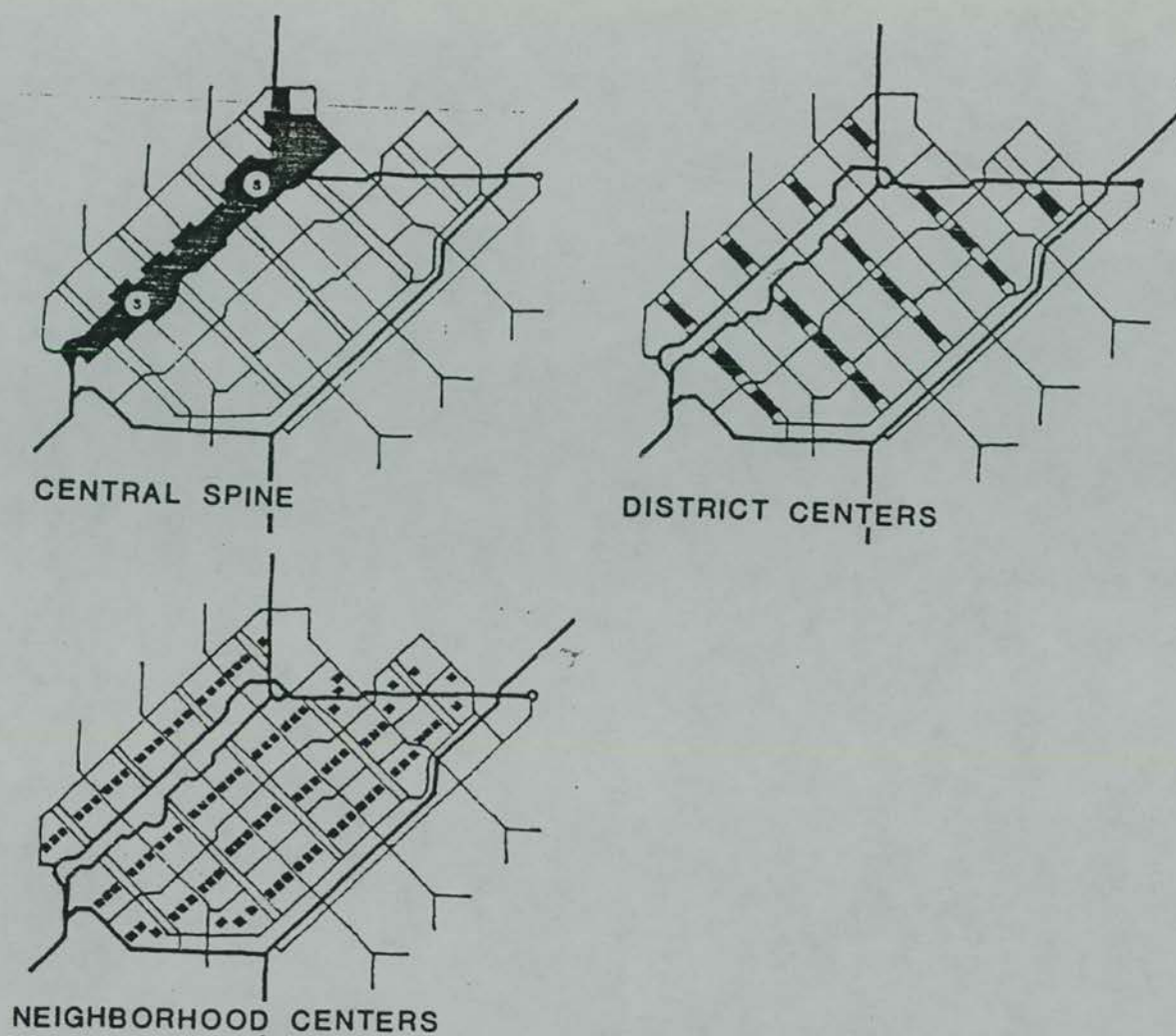


Fig (3.54) Pattern of open space hierarchy (Sabour, 1980, p3:17, p3:18).



Fig (3.55) Public park at the central spine area (Ministries building) (photo by the author).





Fig (3.56) Shelter belt of Sadat City on the south-east side (photo by the author).

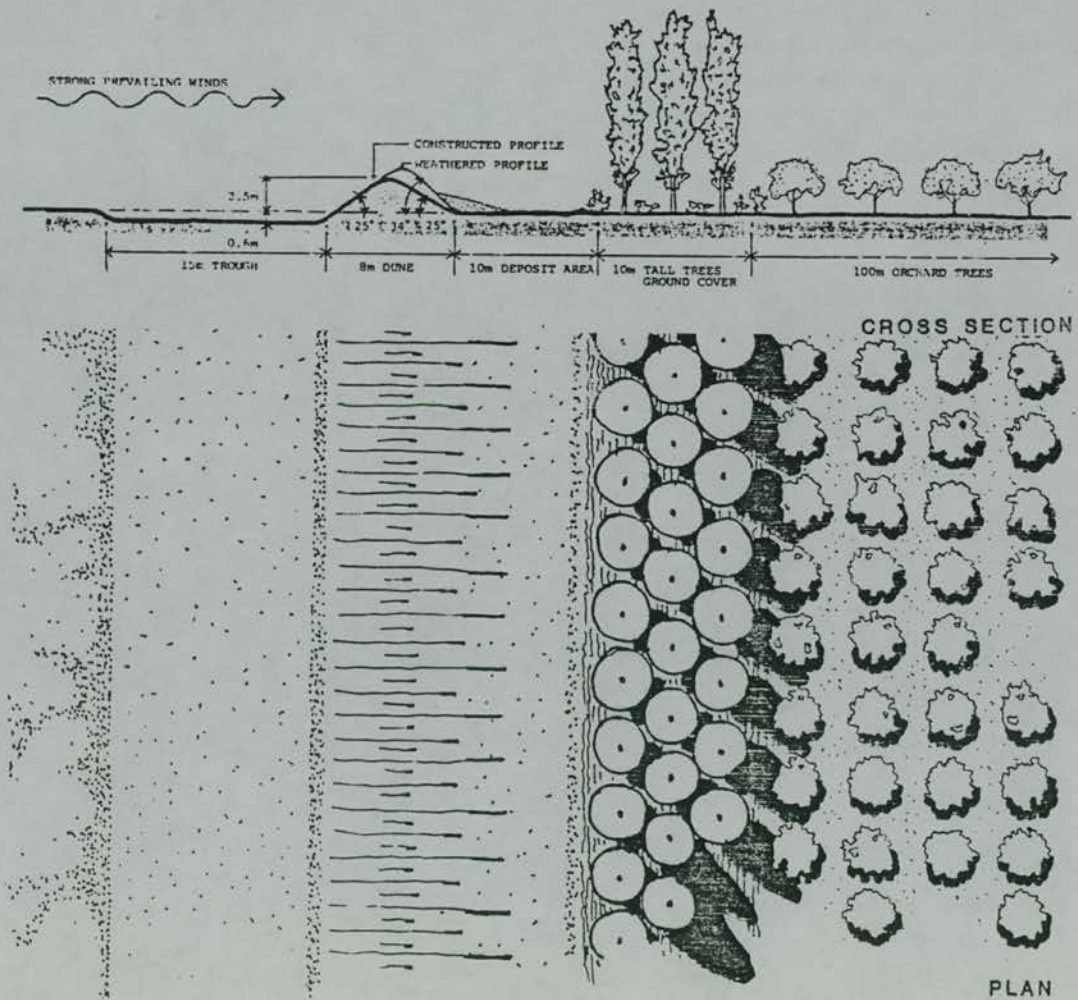


Fig (3.57) Shelter belt design for Sadat city (Sabour, 1980, p7:3:10).

breaks in the type 2 industrial areas, and as a 30 meter wide noise and visual buffer between type 3 industrial areas and adjacent residential areas. The estimated shelter belt cost for the city is 1.4 million EP. The major shelter belt would be irrigated with treated sewage water.

### **Stages of development**

By the tenth year of development, implementation of the critical development mass is expected to stimulate the growth of the city to a population of 150000. The basic form of the city will be established by then and will serve as a guide to future growth patterns. Fig (3.58) illustrates the growth plan for the city.

### **Desert development centre**

A desert research centre was established and was undertaking applied research into alternative, economically viable, integrated approaches to arid land agricultural and community development. It is also exploring the possibility of using natural renewable energy sources, solar and wind, with particular emphasis on the local desert environment [12]. Fig (3.59) shows the main plan for the project. The centre was built with locally available material in a traditional form of desert building (Fig (3.60)). The designer used the same technique as the Hassan Fathy style by using a brick unit (made of local material) to construct the building in the courtyard form (Fig (3.61)). The centre is located north-east of the north entrance to the Sadat city area. The centre is running under the supervision of the American University in Cairo and does not come under the authority of Sadat city. It can be considered a successful step towards a rational approach to development, but unfortunately no-one from the E.N.T. authorities has shown any interest in the activities of this centre. This problem will be examined later in this chapter (3.3).



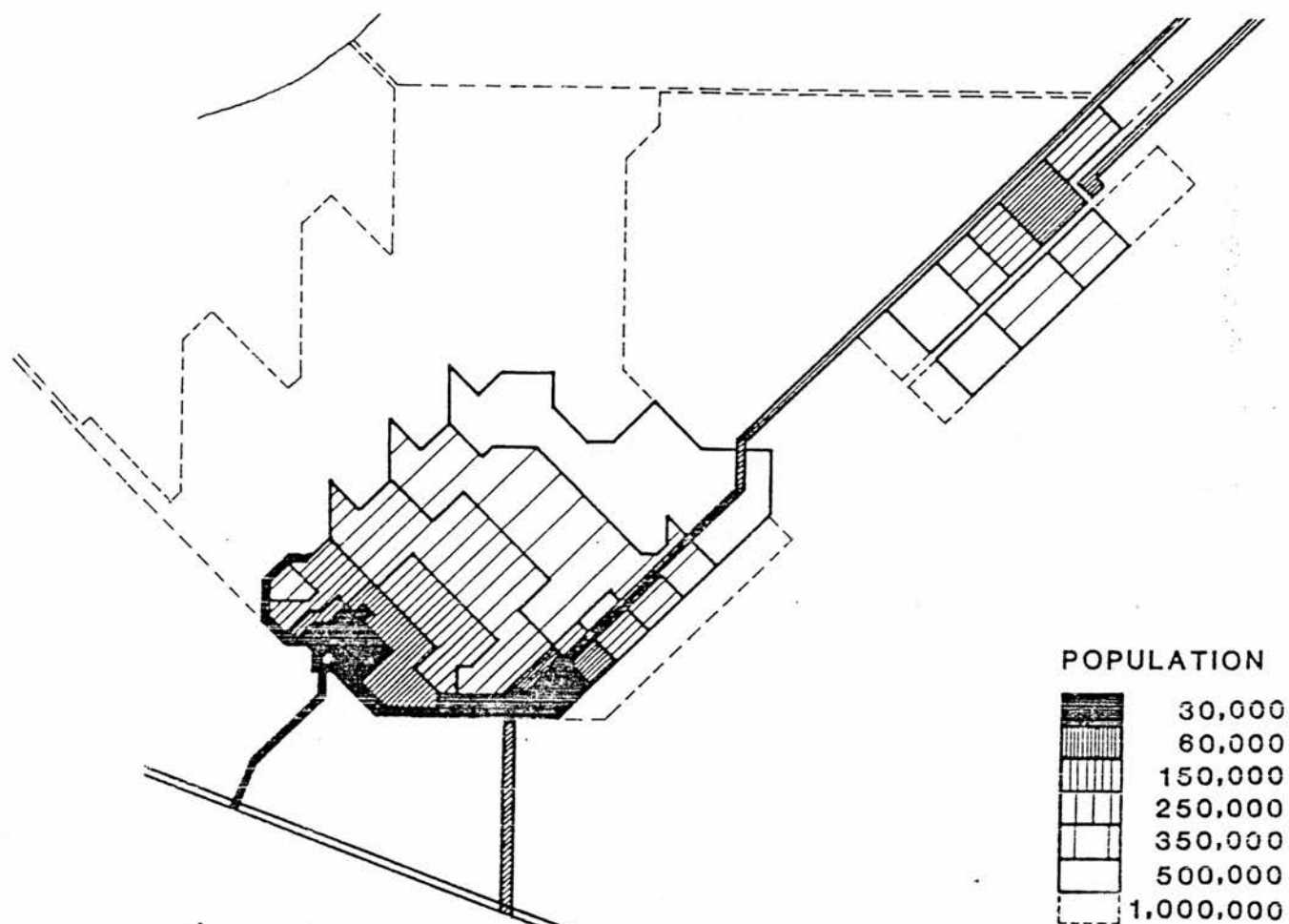


Fig (3.58) The growth of Sadat city (Sabour, 1980, P6:8).

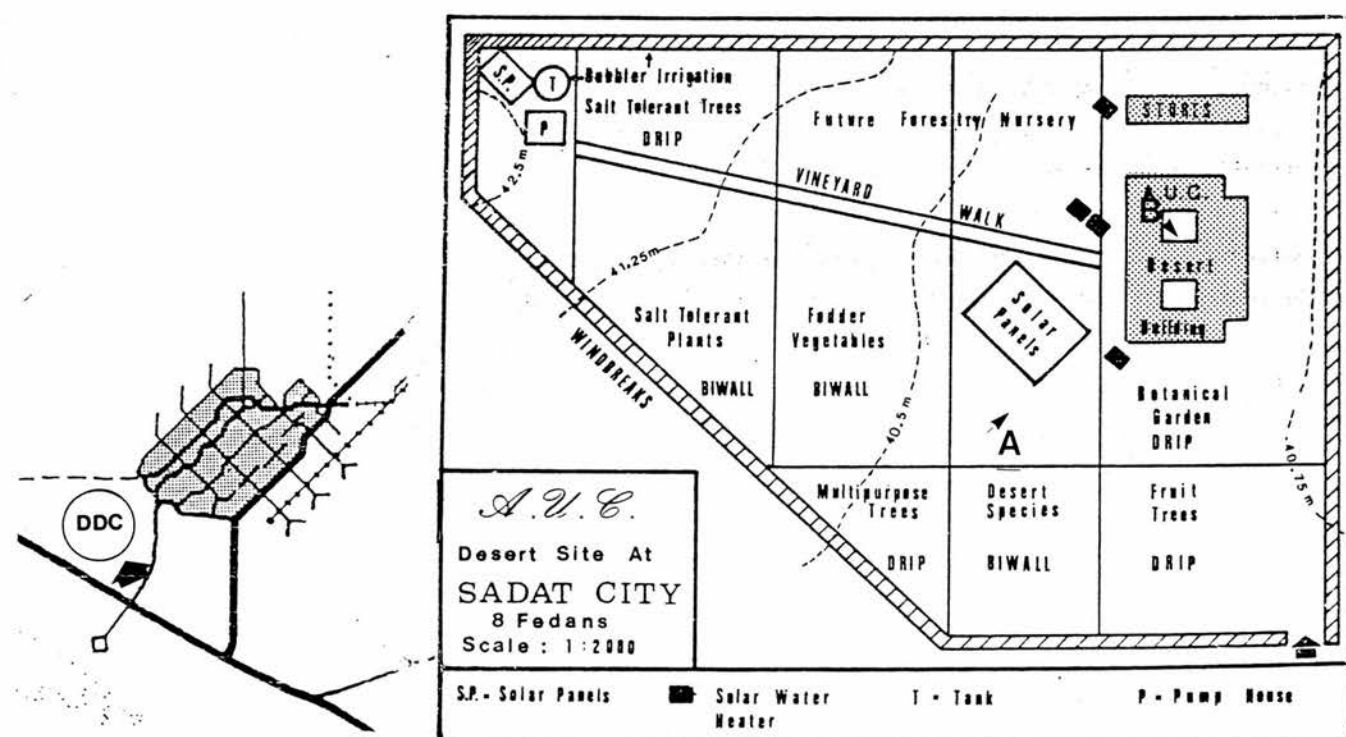


Fig (3.59) The Desert Development Centre (Desert Development Centre Report, American University, Cairo, 1984, p3).



Fig (3.60) The D.D.C. in its traditional form (photo by the author).



Fig (3.61) The courtyard area in D.D.C. building (photo by the author).

### 3.2 EVALUATION

The landscape design concepts for both case studies previously presented will now be evaluated to illustrate what has been done concerning the surrounding environment. Comparative material from other sites was used in this evaluation. The evaluation will be concerned with microclimate, economic, aesthetic and ecological values. It intends to explain how much has been achieved, what failure has taken place in the E.N.T., and to suggest some solutions which may be taken into account for future improvement.

This will be achieved by examining the landscape concept which has been adopted, through the consideration of the main landscape elements of built form, planting, water and land form (see Diagram (3.1b)) (as intermediate stage). Further minor elements will be examined in succeeding chapters.

#### 3.2.1 Built form

"Buildings both individually and in clusters are one of the major physical design elements of the outdoor environment. They structure and define outdoor space, influence views, modify microclimate and affect the functional organization of adjoining landscape" [13].

In arid areas, it seems more reasonable to stress the function of planting as a means of modifying the desert environment. The use of vegetation, water and soil stabilization to control heat, dust and sand is undoubtedly an essential means of providing a favourable microclimate. However, in extremely hot, dry areas, where water is in short supply and vegetation hard to grow, the situation is different: the arrangement of buildings and open spaces as a means of modifying the desert environment becomes the priority [14]. The built form will be illustrated here through the examination firstly of urban form and then of open space:

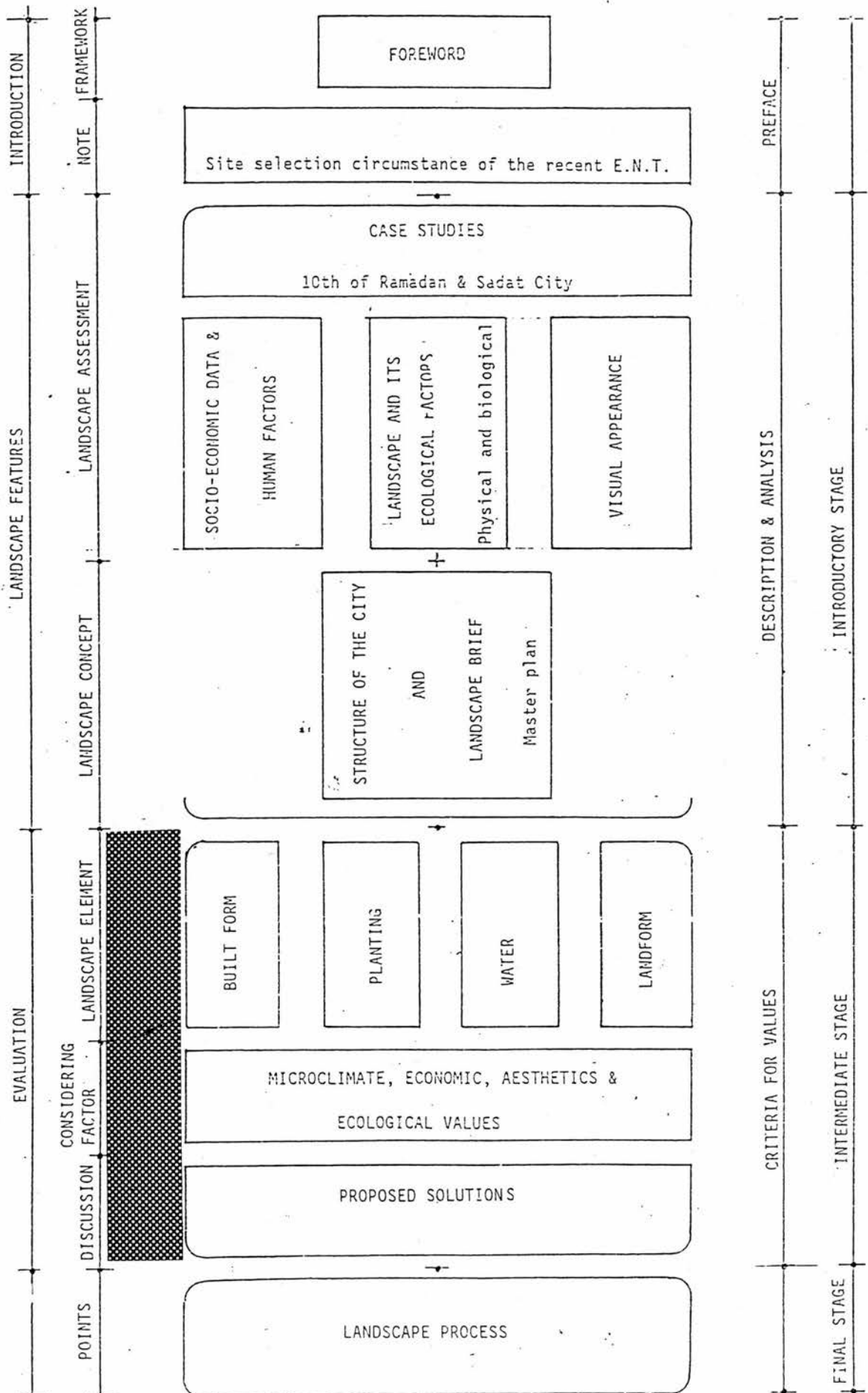


Diagram (3.1b) Shows the content and sequence of research in this section (3.2 Evaluation) (drawing by the author)

## Urban form

From the previous section (3.1 10th of Ramadan and Sadat cities) it seems that the designers of these two new towns have forgotten to take the nature of the site into account in their design and have tended to ignore the climatic and ecological factors in their preoccupation with current styles in vogue. The garden city ideas imported from Europe and North America of extended open green areas are inappropriate for the hot arid climate of Egypt, from the viewpoint of microclimate, the economic and ecological values as well as from a consideration of the social needs of the Egyptian people. Most of the urban forms of the E.N.T. are based on patterns which cater primarily for the requirements of the motor car rather than the real needs of the people who live there. Fig (3.62) illustrates western style planning development imposed on the Egyptian desert (10th of Ramadan). It is similar to the postwar development which has landscape of extraordinary scale, relating more to the vehicle than the pedestrian; buildings tend to float in a sea of space rather than containing it [15]. As Clouston put it in 1978, "We will probably see in the Middle Eastern city (new town) a landscape pattern emerging which is very similar to that of many large British cities. Centres of public, cultural and administration buildings set in (planted areas), with tree lined roads connecting major public open space, recreation space and neighbourhood residential areas. This contrasts with the mass housing area in old cities with only (a few green areas)" [16]. Fig (3.63) shows the similarity between the main concept of Sadat city and Hook, the British new town proposed in 1961.

### --- Basic approach

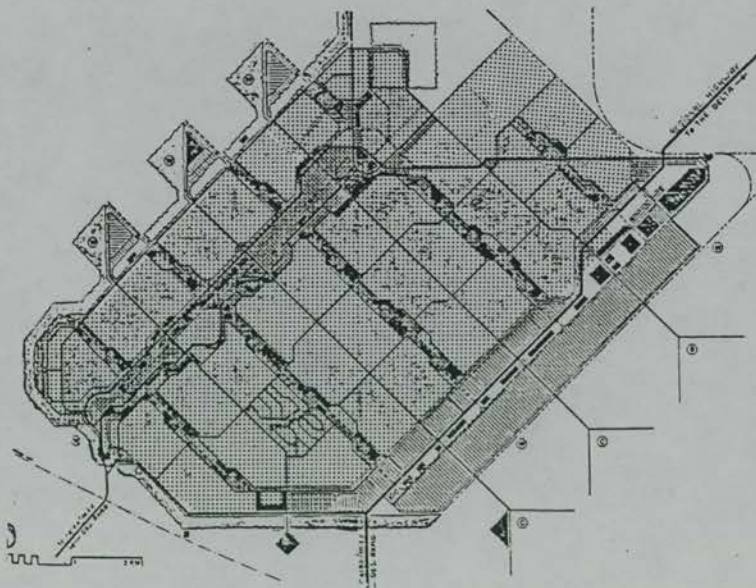
Two factors in particular contribute to the configuration and its environment of urban form - ecology and physical set.

The first one is the ecological factor that always plays an import-





Fig (3.62) Western-style planning imposed on the desert of Egypt - 10th of Ramadan New Town. As it shows, the city has a landscape which relates more to the car than the pedestrian (photo by the author).



a) Sadat New Town



b) Hook British Town

Fig (3.63) There is a great similarity between the main concept of (a) Sadat, Egyptian New Town and (b) Hook, British New Town.

(A. Sabour, 1980, p ; London County Council, The planning for a New Town "Hook", 1961, p85).



ant part in shaping the urban mass. "In nature, form is responsive to the forces acting on it. For instance, plant morphology in various climatic conditions seems to display some similarity to the formation of buildings. Temperature range, humidity and radiation are of similar importance as shaping forces for both buildings and plants. The cross-sections of plant leaves in Fig (3.64) may draw attention to this similarity. According to either favourable or adverse environmental conditions plants open or close their surface pores." [17]

The E.N.T. urban form (Sadat city and 10th of Ramadan) with its outward looking buildings and great expanse of surfaces exposed to the outside environment is in great contrast to the ecological facts mentioned above. The old traditional desert settlements (for example, Siwa Oasis 2.9) are outstanding examples of morphological adaptation in hot arid zones. It is the natural result of a long process of adaptation undergone by areas through centuries to achieve the ideal habitat in a harsh desert environment. Hassan Fathy describes this traditional form saying that these solutions have been found to be much more in harmony with the human physiological functions than the recent modern settlement [18]. In fact there is a great difference between the E.N.T. planning concept and the traditional one. Fig (3.65) shows a comparison between the traditional compact form of the old settlement of Siwa and the modern one of 15th of May new town. It may be generally said that the environmental restrictions, have been ignored in the E.N.T. urban form. The urban form (E.N.T.) approach of open green areas is completely unrealistic. Fig (3.66) shows a feeble attempt by the designer of the Egyptian new town to create an urban form of open extended outward looking green areas in the harsh desert environment. The old art of creating felicitous outdoor places which take advantage of climatic elements and the material resources of the landscape appear to have been

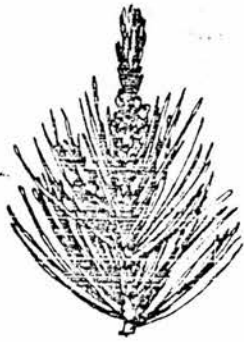


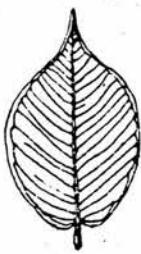

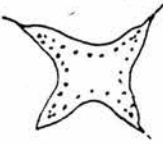


|   |   |   |   |
|---|---|---|---|
|    |    |    |    |
|  | Temperate zone  |  | Hot-humid zone  |
| Cool zone   |  | Hot-arid zone   |  |

Fig (3.64) Plant morphology in various climatic environments. The plants of both cool and hot, arid regions have a massive section with a large volumen compared to their surface area, while those of temperate and humid zones are free and liberal in size and shape (Abdin, A., Ph.D., Liverpool University, 1982, p377).



a



b

Fig (3.65) Shows a comparison between the traditional compact form (inward looking) of the desert settlement of Siwa (a) and the modern concept form (outward looking) of the new desert town of 15th of May (photo by the author).

lost in the E.N.T.

There is no doubt that one of the most basic steps which can be taken for hot arid environments, is to concentrate built forms in order to get the advantages of compact planning such as the traditional one. The more severe the climate, the more important this becomes.

Shy Gap is one of the most successful recent Australian new towns which has a compact concept rooted in the Middle East traditional communities. This city has been described as perhaps the most imaginative attempt to produce a town designed specifically for the Australian (arid area) environment. It was deliberately built as a compact inward facing community situated in a natural amphitheatre mesa [19]. Fig (3.67) illustrates the tight compact city sited in a desert environment.

The second factor that greatly affects the urban form is physical set, that is the orientation (introvert or extrovert composition), the size, the shape and the density of the urban form itself. The orientation of the urban form according to the position of the sun and wind has been considered only for the Sadat city plan (Fig (3.46) above). The streets of the city are oriented north and north-west, which produces the best conditions for catching the favourable north - north-westerly winds and creating the maximum shade generated by the buildings. However, in 10th of Ramadan no such consideration has been given to urban form orientation.

In the recent concept of the E.N.T., buildings (individual or cluster) have been viewed as solid objects in the landscape surrounded by open negative space. Whatever open space is required has been added to the surrounding open space in a largely random way. Most of the buildings have been oriented to face outward where desert surrounds the city or onto an extensive open space (Fig (3.65b) and Fig (3.66) above). The buildings have been oriented towards a view which has never





Fig (3.66) Shows a feeble attempt by the designer of the E.N.T. to create an urban form of open extended outward looking green areas in the harsh desert environment. The green area be will covered with sand, as is shown on the road itself (6th October new city)(photo by the author).



Fig (3.67) Shy Gap illustrates the high, compact housing development so needed in the desert environment. Its landscape, which is minimal, takes full advantage of native vegetation (Newton, P., *Ekistics* 311, March/April 1985, p181). Australia

materialised. The concept theoretically provides maximum light and sunshine as well as maximum extent of open view. It also helps to provide natural air circulation between buildings which is suitable for a green and cool climate but not for an arid and hot one.

In contrast, in the old traditional sites, positively defined outdoor spaces are established within the close building mass of compact courtyard housing. This compact concept has great advantages as mentioned in the previous sections. In addition, the internal open space between the buildings is connected with the external open space by way of covered pathways which create air circulation into and out of the buildings [20]. This concept clearly indicates that the life styles are orientated more inwards than outwards, which is appropriate for the life of the Egyptian people. Fig (3.65a) above shows the urban form of Siwa Oasis which has an introvert composition.

This inward orientation has now vanished from the urban form of the old traditional cities (i.e. Cairo) as a result of extending these cities horizontally and vertically. When these cities were smaller and naturally more accessible, the need for proximity to nature was fulfilled daily by private courtyard gardens which suited the life style of the family, which is introvert looking. With increasing urbanization, the growing need for public green spaces has recently been sensed, Man has been isolated by high buildings and extended urban mass from the large surrounding open space, and has become bound within his small internal open space which becomes unsuitable to fulfil his needs. He has been forced to change his orientation from inwards (courtyard) to outwards (large public open space).

Here it should be made clear that the designer who tries to apply the traditional principle of compact planning to the new development needs to bear in mind that the size of the old traditional city is small



in comparison with recent new cities and their transportation systems. To overcome this difficulty, the size of the urban form of a new city should be in scale and adequately proportioned to allow the compact planning concept to be applied.

The size and shape of the city urban form also plays an active part in creating the microclimate. In summer, the heat from the urban area builds up towards the city centre and rises. This draws in cooler air from the edges of the city (Fig (3.68)). If there are any planted areas located in the path of this moving air, it will alter wind flow, ameliorate quality and help to reduce the temperature. "In Chicago, air flow modelling has shown that a finger plan with corridors of development and wedges of open space would have the most positive effect on air quality" [21].

Considering the shape and size of the urban mass of 10th of Ramadan and Sadat, it is noted that most of these forms are isolated bulky mass types. This may actually lead to hotter central areas, as a result of drawing hot air from the mass itself according to the urban heat island theory. The integration between urban mass and green areas in both towns might have been achieved differently using perhaps the canvas pattern or finger plan and green centre with clusters of urban mass around. Fig (2.63) above shows the ideal integration between the green area (palm grove) and the compact urban form in Siwa Oasis. This will be discussed in more detail in the following section (Planting).

Keeping the desert new town to the right scale to achieve a good environmental quality is also an important factor. The longterm growth possibilities which are proposed for both 10th of Ramadan and Sadat cities (Fig (3.32) and Fig (3.58) above) are not practical; the city is never static and it is difficult to define an economic limit to its size. Attia 85 has suggested that the growth of such desert towns could

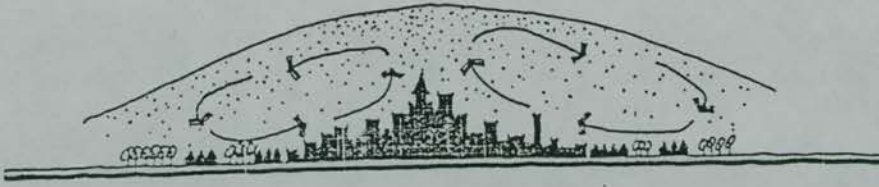


Fig (3.68) The urban heat island smog dome over large cities occurs periodically due to urban activities. Air rises over the warm city centre and settles over cooler environs so that a circulatory system develops. The dome and its effect on city climate may persist until wind or rain disperses it (Hough, M., City form and natural processes, 1984, p33).



Fig (3.69) Shows the feeling of isolation within in desert area.

occur in the form of a series of new satellites surrounded by green areas [22].

This concept of growth has some advantages. Firstly, the urban mass of buildings will provide protection to the nearby area being cultivated close to the urban mass. This green area will provide the natural protection for the next urban mass and consequently for the city as a whole. This typically occurred during the growth of most traditional desert settlements (Fig (2.63) above). Secondly, the establishment of settlements in a special grouping pattern, rather than as a single isolated mass, will avoid the psychological feeling of isolation which is found in most of the E.N.T. sites (Fig 3.69)).

In general, the vernacular form of the old traditional desert settlement and its urban landscape are examples of adaptation that provide some inspiration and guidance for application today.

As to such size and shape, Fig (3.70) shows the neighbourhood unit 20 of 10th of Ramadan new city. The flat blocks used are separated by wide spaces and are a very bad urban form from the viewpoint of thermal absorption. They allow the sunlight to penetrate the space directly to ground level, giving strong radiant heat gain. At the same time, this type of layout generates glare which is considered a common problem for most of the E.N.T. sites. Fig (3.71) shows flat blocks arranged around a wide open space. Glare here is considered the main problem. This type of building will speed up the desert wind and create eddies and air turbulence giving an undesirable microclimate. In addition, high rise buildings, particularly those above four storeys in height, are expensive, especially in countries like Egypt where the building industry is relatively unsophisticated. This type of building and its arrangement also creates a lack of architectural diversity. Most of the E.N.T. forms are too large and greatly lacking in place identity; buildings

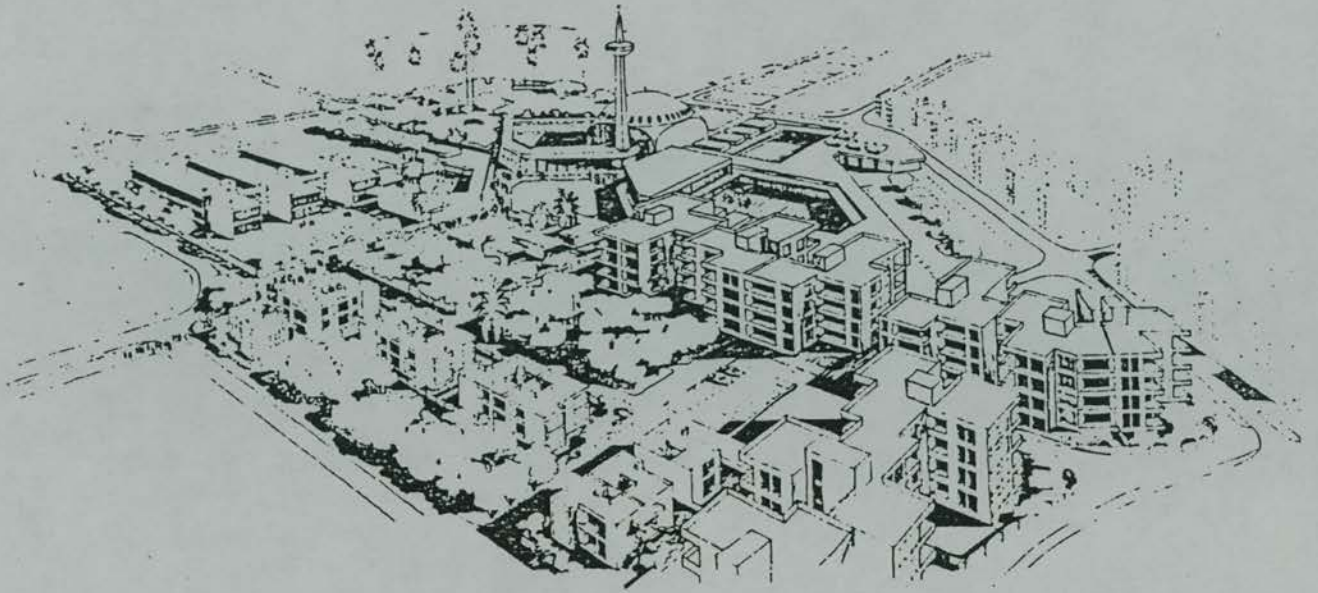


Fig (3.70) The proposed neighbourhood unit 20 of 10th of Ramadan (SWECO, 1978, p11.5).



Fig (3.71) Shows flat blocks arranged around a wide open space. The glare seems a serious problem (photo by the author).



are placed on the landscape stiffly and diagrammatically and this creates a feeling of uniformity and rigidity of pattern. Hyland comments that any visitor to the new Egyptian cities quickly notices their orderly and rigid form with wide, straight streets and multi-storey flats [23].

Building form and its arrangement is a critical factor for any new development in a desert area. The generally uniform low building layout of older traditional desert towns, arranged along curved and winding streets provides great protection against wind and climate. The optimum solution to reduce radiant heat gain is that of the traditional city where buildings are packed closely together to shade each other. Fig (3.72) shows how the plan of old Cairo illustrates these characteristics.

In hot, dry climates buildings should be grouped close together to provide shady, narrow spaces in between. This may be achieved in a number of ways, for example by using arcade columns and small enclosed courtyards; even larger public open spaces should be thus enclosed, inward looking and shaded for most of the day. Fig (3.73) shows some ways of providing shade.

In spite of the multistorey buildings which dominate the residential areas of most of the E.N.T., the density is extremely low when compared with the urban areas from which the new residents of the E.N.T. originally moved from. Table (3.8) illustrates a density figure for some of the recent new communities in Egypt (Planning and Technology Centre "El Amal City", Cairo Uni, 1982, p66, Arabic)\*. The illustrated figures may be considered very low in comparison to Cairo's urban area which has a compact residential density with an average of 510 p/h (in some sectors reaching 1513 p/h) [24], some 10 to 12 times that of 10th of Ramadan.

---

\*"Note that the figure for the Heliopolis Area refer to density of the area when the project was designed, 1950. The situation now is completely different."



Fig (3.72) The urban form of the old city of Cairo (El Sioufi, A Fatimi Harah, The Aga Khan program for Islamic architecture: Harvard Uni., 1981, p11).

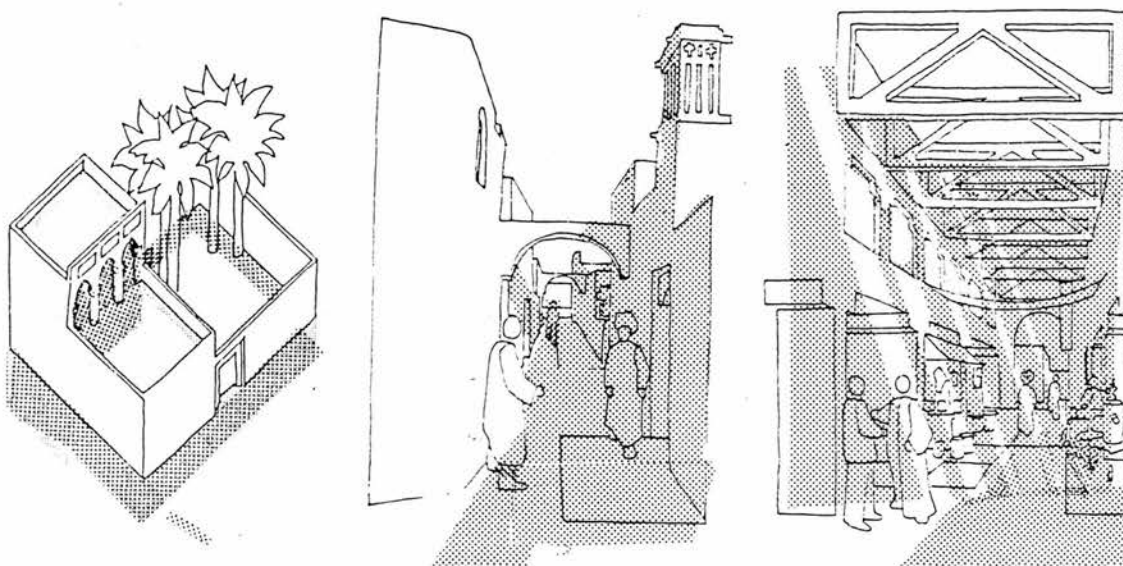


Fig (3.73) Some alternatives for providing shade by using the structural element of the building (Kriken, J., "Town planning and cultural and climatic responsiveness in the Middle East, "Design for Arid Regions", Galany, G. (ed.), New York, 1983 p101, 105).



Table (3.8)

| Persons/hectare | Community area  | Year | Type     |
|-----------------|-----------------|------|----------|
| 22              | Heliopolis      | 1950 | District |
| 67              | 10th of Ramadan | 1977 | New city |
| 111             | Nasr City       | 1960 | District |
| 145             | Helwan          | 1965 | District |
| 145             | Sadat           | 1980 | New city |
| 225             | Port-Said       | 1974 | District |

The 10th of Ramadan can be considered the worst new city from the aspect of achieving an adequate density. The Master Plan Report states that, as they did not have to face high land costs, density was not a matter of first concern. It seems, however, that the cost of land was the main factor in controlling density. Other critical factors in relation to density such as climate, social and economic factors seem to have exercised little influence. A comparison between Sadat city and 10th of Ramadan in relation to their area has been made (Fig (3.74)). It shows that in spite of the two new cities having been planned for a population of 500000 in a desert area, the 10th of Ramadan figure occupies a far larger area.

In general, the recent urban pattern of the E.N.T. is characterized by low density and lengthy road networks and infrastructure, all of which increase both capital and maintenance costs and the underlying consumption of energy. In fact, the compact higher density concept for new desert towns offers a cheap and technically competent solution to cope with the extremities of a desert environment. Fig (3.75) shows a comparative design for 48 acres with conventional sprawl or with an equal number of housing units set in compact form on a slope. There is a great differentiation in infrastructure and road network lengths, open space and other uses. The compact city allows a very noticeable short-

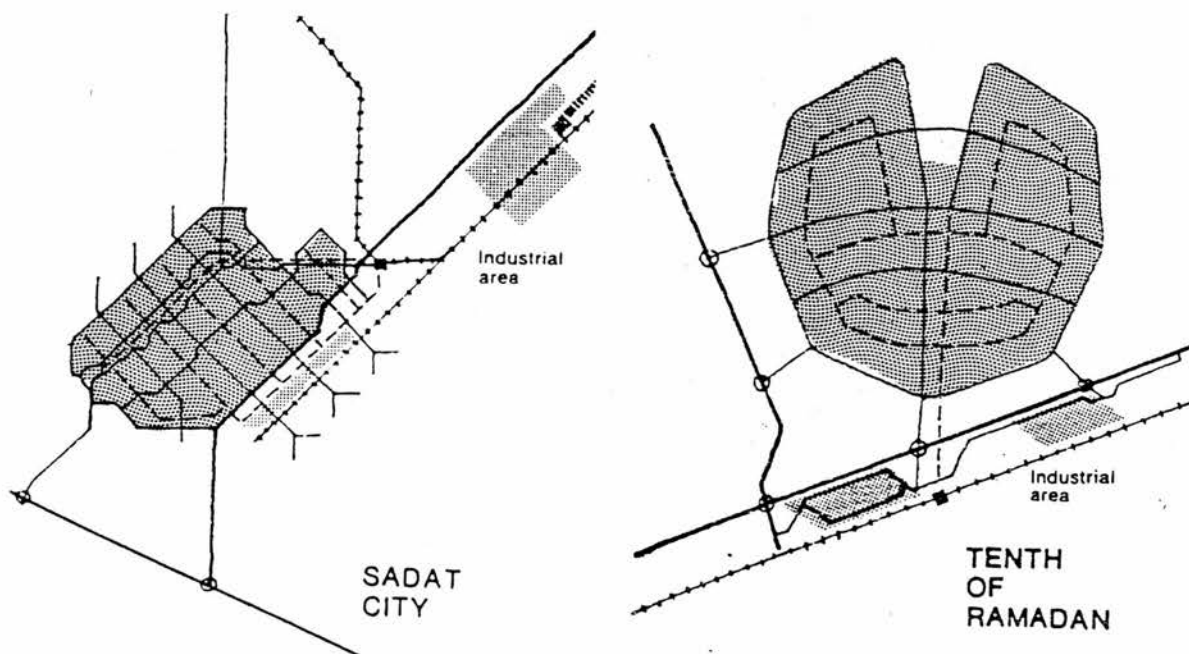
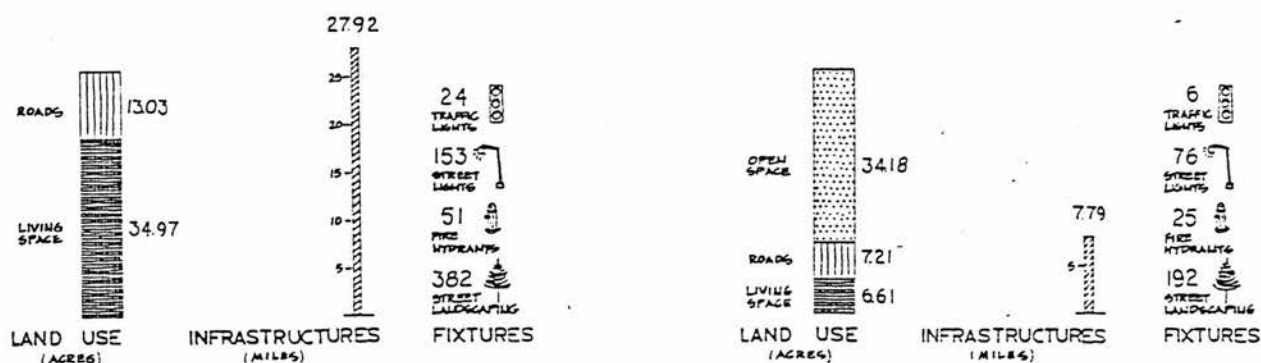
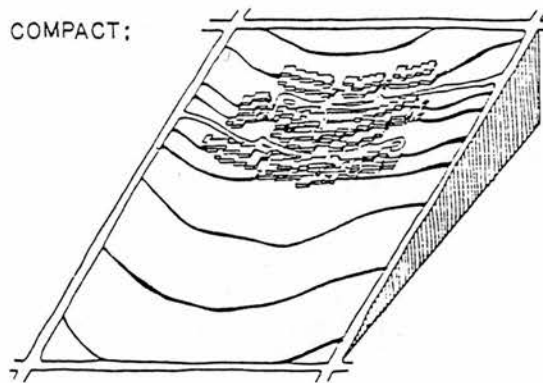
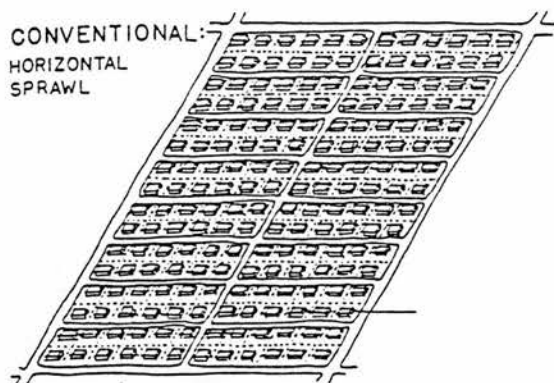


Fig (3.74) Land area comparison between Sadat and 10th of Ramadan new cities. Both of the cities have been planned for a population of 500000, but as the figure shows the 10th of Ramadan occupies a far larger area (Sabour, 1980, p4:11).



| LAND USE                         | CONVENTIONAL HORIZONTAL SPRAWL         | COMPACT              |
|----------------------------------|--|----------------------|
| 1. LAND FORM                     | ALMOST FLAT                            | LOW AND MEDIUM GRADE |
| 2. LAND SIZE                     | 48 ACRES                               | 48 ACRES             |
| 3. NO. OF DWELLING UNITS         | 192                                    | 192                  |
| 4. SIZE OF EACH DWELLING UNIT    | 1500 FT <sup>2</sup>                   | 1500 FT <sup>2</sup> |
| 5. SIZE OF EACH LOT              | 7933 FT <sup>2</sup> (18.21% OF ONE A) | 1500 FT <sup>2</sup> |
| 6. LAND USES:                    |  |                      |
| 6A. NET DU FLOOR                 | 6.61 A                                 | 6.61 A               |
| 6B. NET LIVING SPACE             | 34.97 A                                | 6.61 A               |
| 6C. ROAD AND STREET SURFACES:    |  |                      |
| 6CA. INTERIOR ROADS (25' WIDE)   | 5.52 A                                 | 1.15 A               |
| 6CB. PERIPHERAL ROADS (40' WIDE) | 5.22 A                                 | 5.22 A               |
| 6CC. PEDESTRIAN WAYS (4' WIDE)   | 2.29 A                                 | 0.38 A               |
| 6CD. PARKING SPACE               | NONE                                   | 0.46 A               |
| 6D. OPEN SPACE                   | NONE                                   | 34.18 A              |
| TOTAL                            | 48.00 A                                | 48.00 A              |
| 7. INFRASTRUCTURE LENGTH:        |  |                      |
| 7A. INTERIOR ROADS               | 1.82 MI                                | 0.38 MI              |
| 7B. PERIPHERAL STREETS           | 1.08 MI                                | 1.08 MI              |
| 7C. PEDESTRIAN                   | 4.72 MI                                | 0.79 MI              |
| 7D. SEWAGE                       | 2.90 MI                                | 0.68 MI              |
| 7E. STORM SEWER                  | 2.90 MI                                | 1.46 MI              |
| 7F. WATER                        | 2.90 MI                                | 0.68 MI              |
| 7G. TELEPHONE                    | 2.90 MI                                | 0.68 MI              |
| 7H. GAS                          | 2.90 MI                                | 0.68 MI              |
| 7I. TV CABLE                     | 2.90 MI                                | 0.68 MI              |
| 7J. CENTRAL HEATING              | 2.90 MI                                | 0.68 MI              |
| TOTAL                            | 27.92 MI                               | 7.79 MI              |
| 8. TRAFFIC LIGHTS                | 24 FIXTURES                            | 6 FIXTURES           |
| 9. STREET LIGHTS                 | 153 FIXTURES                           | 76 FIXTURES          |
| 10. FIRE HYDRANTS                | 51 FIXTURES                            | 25 FIXTURES          |
| 11. STREET LANDSCAPING           | 382 TREES                              | 192 TREES            |

Fig (3.75) Comparative design for 48 acres with conventional horizontal sprawl or with an equal number of housing units set in compact form on a slope. Note the great differentiation in infrastructure and road networks lengths, open space and other land uses. The economic and social costs are vastly different; so, too, is the energy consumption (Golany, "Design for Arid Regions", New York, 1983, p3).

ening of all infrastructure networks and transportation systems. For example, the cost of providing a deep screen of a particular type of tree to protect the new desert settlement from sandstorms will be much less if the area of the new settlement is relatively small; this would also apply to maintenance costs.

The compact form with its close and proximate living will also help to enhance the social interaction among different age groups. Most of the new inhabitants of the E.N.T. were from high density areas. They already needed to adapt themselves to new conditions in the new town, and the psychological shock of comparative social and physical isolation prompted by inadequacies in planning has not assisted this process of adaptation to a new environment. The compact concept must then be a key to making arid land settlements feasible.

#### **Open space**

There is no doubt that most of the recent E.N.T. show excessive amounts of open space and these can create a very unpleasant environment in a hot desert city. In fact, the microclimate which has resulted within the new desert towns often becomes worse than the desert itself, because they have many more hard surfaces to collect and radiate heat. Much of this open space provision has been based on a very biased emphasis on recreational needs to the exclusion of other necessary functions. The open space in this section will be examined with regard firstly to the main open space concept, then secondly to the open space allocated to roads, residential use and open public areas.

The main open space concept of the E.N.T. has been characterised by an extensive open space feature. The 10th of Ramadan is the most remarkable example of redundant open space. According to Table (3.3) above, roads cover 25% of the total area of the city. The proposed green areas occupy 10% of the total area and the built-up area for other

sections (residential and industrial areas) covers less than 30%, which means that open space occupies 70% of these sections and 45% of the city area. The latter figure thus indicates that open space occupies approximately 80% of the total area of 10th of Ramadan new city. For Sadat new city the figure is rather less at 65-70% of the total area. These figures are very high when compared to existing typical Egyptian desert communities, where open space characteristically does not cover more than 40% of the total area [25].

Not only is the high degree of open space a major problem in the E.N.T., but the shape and distribution of this open space within the urban mass is also fundamentally poor in concept. The 10th of Ramadan's main open space concept of a city centre (1000 m wide) with two parkways (each 500 m wide) (Fig (3.76)) which run through the city from south to north, to provide drainage for storm water, does not seem logical. As it is mentioned in the Master Plan Report that no evidence of heavy storm water has been produced, there is, therefore, no need to have wide channels for drainage similar to the ones provided. The same space has been formed in the central area of Sadat city, where a wide open space runs through the urban mass from south-west to north-east. In fact, these wide channels in both Sadat and 10th of Ramadan city carry cold winds from the north in winter and hot, dusty winds from the south in spring, both of which spread dust over the entire city.

The main pattern of open space for most of the E.N.T. seems to be a product of the transportation and road system, most of the main public open space having been directly influenced by the road network. Buildings have been situated and orientated with the respect to the main road rather than in relation to their function. As a result, undefined large open spaces have been created which dominate the new towns. Fig (3.77) illustrates one of these spaces. At the same time, the second row of



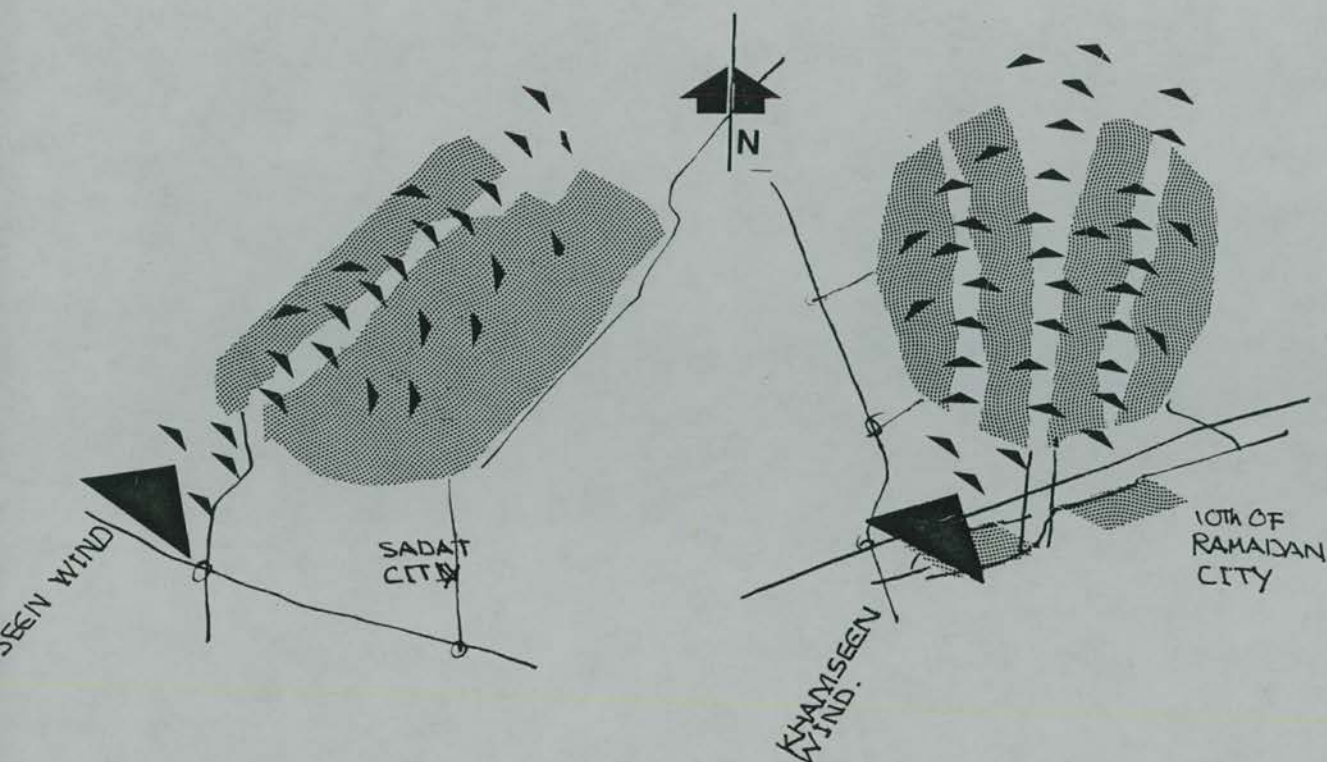


Fig (3.76) The wide channels with cold and hot, dusty winds which spread over the whole city (sketch by the author).



Fig (3.77) The main pattern of open space seems to be a product of the transportation and road systems (photo by the author).



buildings behind the main road has been sited in a scattered and random pattern. This creates a weakened and undefined sense of open space (Fig (3.78a and b)).

A large motorway cutting through the middle of towns and occupying huge expanses of land creates a sense of spaciousness. Roads give the wind a perfect opportunity to reach ground level and speed up. The 100 m main road of 10th of Ramadan and the 58 m road of Sadat city (Fig (3.79)) will resist all attempts to control heat and wind in their vicinity, particularly after buildings line their edges. The wide areas which were added to the side of the main roads as green buffers to control pollution have been left sandy without vegetation and unfortunately become a source of pollution (Fig (3.80)). The problem of open space is not only confined to the main roads, but also affects secondary roads. It is not necessary to have a wide road to serve only a few houses, as is the case in most of the E.N.T. Even local roads used only for light traffic are extremely wide (Fig (3.81)).

The desire for a favourable microclimate suggests small streets, as in traditional desert cities, but at the same time contemporary transportation modes tend to be space-consuming and generate pressure for wide street spaces. These conflicting forces must be balanced. Street networks represent one of the greatest potential hazards to the system of microclimate management. Narrow and winding streets reduce the effect of stormy or dusty winds, produce minimal heat exchange and are normally shaded and cool during the day, as well as warm at night. Narrow streets may retain humidity within their space; this then decreases ambient temperature throughout the day. Fig (3.82) shows the differences in temperature for a wide square with no trees, a wide avenue with trees and a narrow street. There is a remarkable difference between the microclimates produced by the narrow street and the two

a



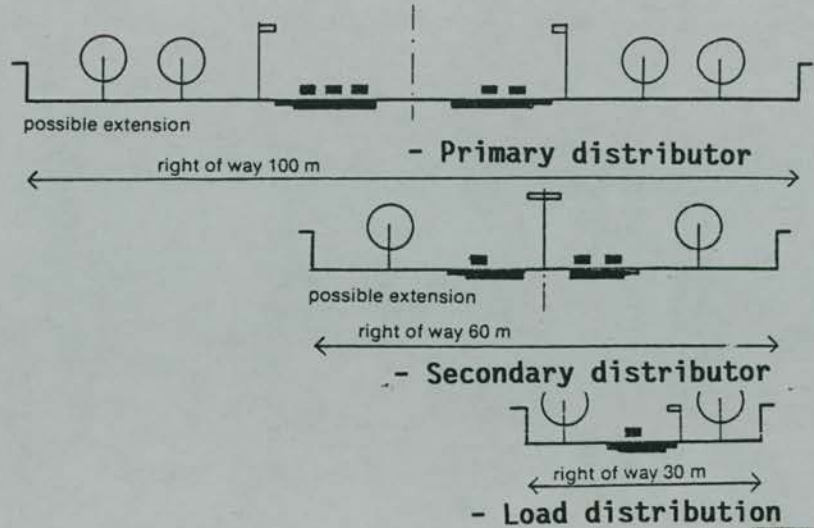
b



Fig (3.78) a) The first row of buildings has been orientated with respect to the main road which has a slight curve.  
b) The second row of buildings has been orientated with respect to the first row. Accordingly undefined open space has been created.

(Photo by the author).

## 10th of Ramadan



## Sadat city

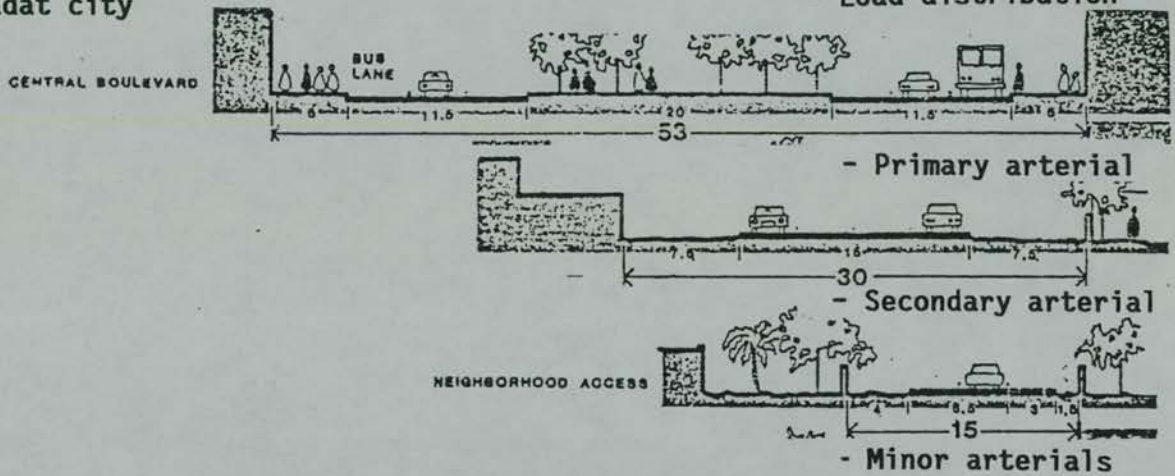


Fig (3.79) Road levels of 10th of Ramadan and Sadat cities.

(SWECCO, 1978, p71; Sabour, 1980, p3:35).



Fig (3.80) A wide area has been left without treatment beside the main road of 15th of May new city. These areas become sources of dust and pollution for the city (photo by the author).





Fig (3.81) Local street in a neighbourhood of Sadat city. It has a side road of cement tiles containing beds of sand which are proposed to be green.

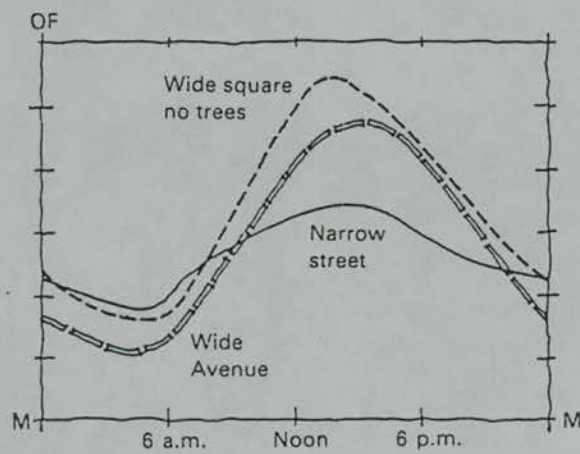


Fig (3.82) Diurnal temperature variations in Vienna, 4-5 August 1931. The graph shows the difference in temperature for a wide square with no trees, a wide avenue with trees and a narrow street (Houfa, op.cit, 1984, p43).

others. A fairly common mistake of the E.N.T. which could have unpleasant results in a hot climate is to place unnecessary paved surfaces (asphalt and cement tiles) which store up heat and radiate it to the external facades of buildings. The wide main roads should be as limited as practicable without causing undue inconvenience to service vehicles. However, if the planner must adopt a wide street pattern, sufficient green spaces should be spread over the area in order to redistribute the heat evenly throughout the city and avoid its concentration in the centre. This should, however, be the exception rather than the general rule. The previous rules should be applied to the pedestrian circulation system.

The green space within the residential areas will be examined in more detail in Part III (Chapter 4 and Chapter 5), but here it could be briefly said that there is a large expanse of open space within the area of most of the E.N.T. Most of these spaces are proposed to be green to support recreational needs, but in fact they have been left dry, dusty and unused by local inhabitants. Fig (3.83) shows open space between the residential areas of 10th of Ramadan.

#### **---Basic approach**

Hot, dusty winds, summer heat, winter cold, humidity and glare are frequent causes of climatic discomfort in open space, but they can be ameliorated by paying attention to detailed landscape design. This then should be the first step in the establishment of a larger landscape. Without this response, the designed landscape may be clearly identified with the bland, faceless so-called international styles (E.N.T.) taking its name from the architectural fashion which gave rise to it.

Consideration of the location of open spaces, their pattern of distribution within the city, size and positioning in relation to the adjacent land use is vital, not necessarily from the functional aspects,

but rather from the stand point of the microclimate which can be generated [26].

In the most successful example of climate manipulation in extreme environments, the emphasis has been on an urban texture of small spaces and low buildings. This concept takes its roots from the traditional desert city. Mien agreed with this concept when he observed that the necessary amount of open space in an urban area and its optimum distribution, cannot be stated quantitatively. From a climatic point of view, however, a fine mesh of open space, distributed evenly over the whole city, is more effective than the reliance on a few large areas (i.e. E.N.T.). In hot, arid climates, small open spaces increase areas of shade and reduce the build-up of solar radiation. These small open areas are easy to control with regard to plants, water and ventilation. On windy days, they are less subject to cold or dusty winds [27].

At the same time, this concept of small open spaces will give a feeling of contrast between the relatively small open space (human scale) in the urban area and the extended space in the outer part (vehicle scale).

In general, in all the E.N.T., the provision of open space in its different forms (roads, spaces between buildings or even recreational outdoor areas) is far too generous in relation to built-up areas.

The courtyard concept is the ideal form of open space for residential areas in a hot, arid climate. It not only provides a desirable microclimate for its residents, but also is the ideal form to fit the people culturally. The open space in the traditional settlement (i.e. courtyard) is always perceived as a place, in contrast to western perception of the building as a place (Fig (3.84)). In general, active open spaces in hot, arid areas should be small and protected from the harsh desert environment.





Fig (3.83) Aerial view of One of the open spaces of a residential area of 10th of Ramadan. The area is too wide and covered with sand and dust (photo by the author)

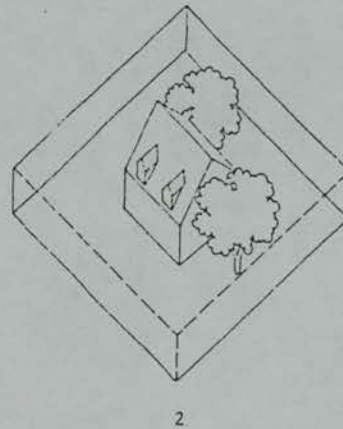
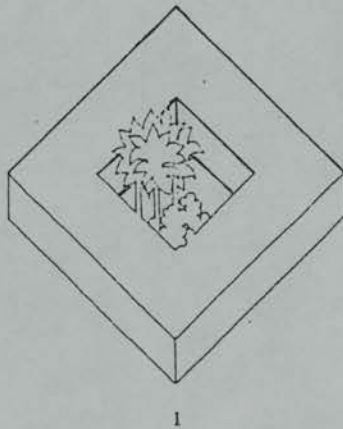


Fig (3.84) The open space for the courtyard house is always perceived as a place in contrast to western perception of the building as a place (Golany, 1983, p99).

Most of the public open areas for the 10th of Ramadan and Sadat city have been designed to be a universal grassed landscape, but actually they have been left without vegetation, ugly and dusty. Most of the outdoor recreational area has not been constructed yet, but from the Master Plan it seems that these areas capture a great area of the cities. Fig (3.60) above shows a public open space area in Sadat city which is proposed to be used as a park. Industrial structures are surrounded by large open areas without any planting or ground cover. Likewise, colleges, hospitals, schools and religious buildings are among the institutions which control large amounts of open space. There is a great potential for these open spaces to be effectively utilized. Also areas reserved for potential future expansion occupy a large area of most of the E.N.T. Large open areas which are not actually needed for a specific purpose should not be created and the necessary ones should be designed carefully, incorporating supplemental wind protection for both the spaces themselves and the parts of the settlement lying beyond them.

In general, the open space is the largest consumer of land in most of the E.N.T. The apparent failure of the open space policy for recent E.N.T. should bring attention to the futility of such garden city concepts in arid areas. They are not only naive in conception but totally impractical in their implementation and maintenance.

### 3.2.2 Planting

(See Diagram 3.1, page 237 .) "Along with landform and building, plant materials constitute the major component used by landscape architects in most projects to organise space and solve problems" [28].

Plants have a major effect on the maintenance of an equable micro-climate within new cities. In hot, dry climates, the importance of vegetation is a critical element in landscape design. However, in areas where water is perpetually short and where the range of trees, shrubs and grasses suitable for use in specific locations within arid areas is fairly limited, this can be extremely difficult to achieve.

Plant materials as a landscape element are not well understood in the E.N.T. Despite the numerous potential functions of plants in the design and management of the outdoor environment of desert new towns, the planting policy of the E.N.T. is preoccupied with aesthetic design conventions which are more concerned with decorative landscape than with a form which has evolved from the necessity of its intended purpose. Most of the lay people and even some of the designers of the E.N.T. still think of plant materials exclusively as a decorative element. As a result, they are often placed in the design of an outdoor space almost as an afterthought in the completion of a project.

Plant material as a landscape element will be examined firstly from the view point of the main planting concept and its reality, then secondly from the points of view of planting design characteristics, plant selection and objectives.

#### **Main concept**

There is no doubt that a spacious, heavily irrigated lush green landscape is intended as the main characteristic of the landscape concept that dominates the 10th of Ramadan and Sadat city sites. This concept is associated with the imported urban form concept introduced to

the desert from non-arid areas and discussed in the previous section. Grass is perhaps the most prevalent planting element found in the E.N.T. concept. It can be found everywhere in the desert area of the E.N.T. in large landscape areas as in the approach to Sadat city (Fig (3.85a)) or in small areas between houses (Fig (3.85a)).

The need to conserve water, the poor soil conditions and the complete dependence upon irrigation to support this shallow rooted herb, indicates that this type of open space must be continuously maintained if it is to be kept green. The recent E.N.T. concept, however, does not seem practical for desert towns. Economy and quality in a desert situation strongly suggest the reduction of such areas wherever possible.

Fig (3.86) shows the plan and a view of extended open space which was designed to be an area of grass within a residential area. This example illustrates the inadequacy of such a feature. The area was planted some eight weeks before the photograph was taken and daily, continuous irrigation was undertaken by the contractor to keep the area green until responsibility for it was handed over to the city authorities. The photograph shows the ludicrously impractical use of hoses for manual irrigation. Such aerial irrigation in direct sunlight (especially desert) is not only extremely wasteful, but also scorches the grass. The whole area is bound to dry up for lack of maintenance only a few weeks after being handed over to the city authorities. Fig (3.87) shows this later stage in another part of the 10th of Ramadan. The areas shown have been grassed three times within 12 months and have now been left as a dustbowl.

It is apparent, therefore, that existing E.N.T. landscape design objectives fail, largely due to the fact that the design intentions are both ill-considered and virtually impossible to put into practice;





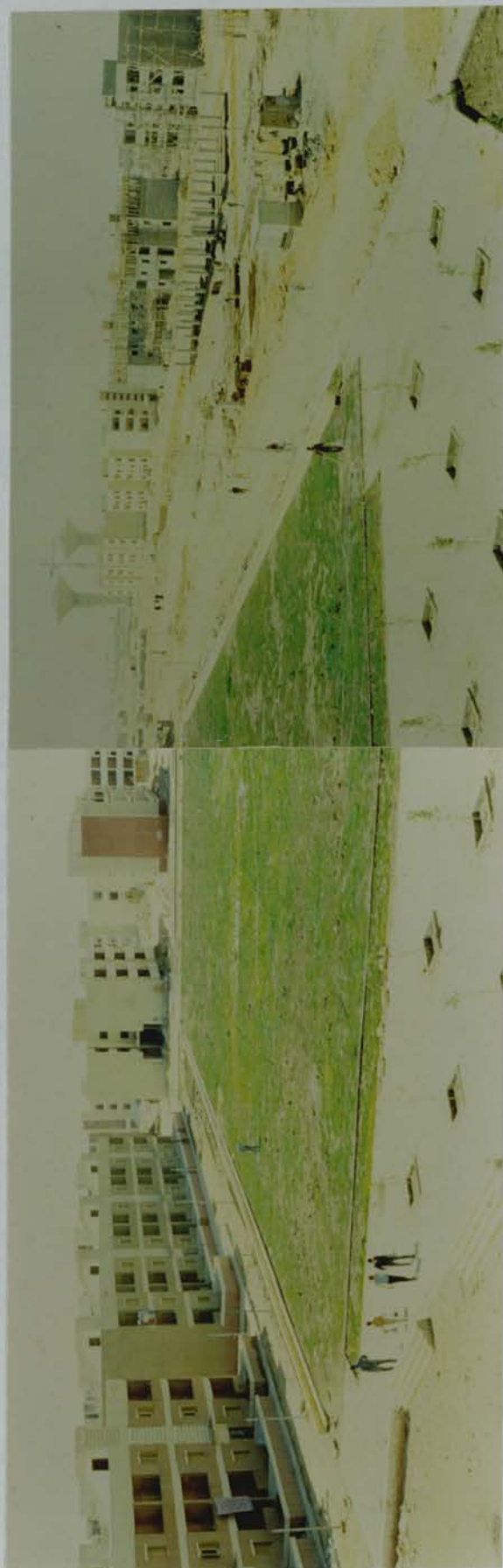
a



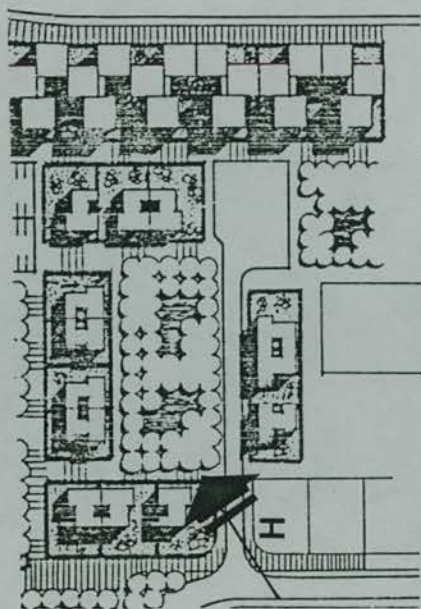
b

Fig (3.85) Open grassed areas can be found everywhere in the desert E.N.T. in large landscaped areas like the approach area for Sadat city (a) or in small spaces between houses in the same city (b) (photo by the author).





View from point H



Plan for the area, Sadat city.

Fig (3.86) An extended open space within the residential area, which was designed to be a grass area (photo by the author).

permanent grass areas are simply not feasible in desert areas. They exist naturally in desert ecosystems only as ephemera for a few weeks after widely spread and very exceptional rain storms.

The concept of enormous grassy areas in a desert new town is fanciful. It has been achieved in the early stage of 10th of Ramadan's development in response to political slogans like "greening the desert". It has succeeded, but only temporarily and at high cost. The amount of energy and effort spent on creating this concept does not justify the result. It was mentioned in the "Growth Plan of 10th of Ramadan, Report 1982", drawn up as an evaluation of the first stage of development, that there is a relatively high cost for plantations in the first stage. The budget for the second stage has been reduced and, as a result, planting throughout the city has diminished and stopped in the second stage of development. Large areas which <sup>have</sup> been left between buildings for planting remain dusty without any treatment (Fig (3.88)). Even the early planted areas which were constructed in 1979 (Fig (3.18) above) have not been maintained and unfortunately many of them have degenerated into a poor condition.

In a large scale development, a heavily irrigated, lush green landscape does not mean the best solution for creating a reasonable microclimate in a desert area. A comparative study of the microclimate of a house in an irrigated landscape area and another in a desert landscape area at Phoenix, Arizona has been made [29] (Fig (3.89)). The air temperature followed similar patterns (Fig (3.90)). However, the ambient air temperature of the irrigated site was slightly cooler than the desert site during the day (by 3-5°F). Thus the desert site recorded the highest temperatures during the day, but also the lowest temperatures at night.

Alternatively, it was found that the irrigated site, while it had



Fig (3.87) The proposed grass area has completely dried up in community no. 1, Spoil dumps and litter dominate the area - 10th of Ramadan (photo by the author).



Fig (3.88) One of the incompleted open spaces of the first stage of 10th of Ramadan - community no. 4 - as a result of inadequate funding (photo by the author).



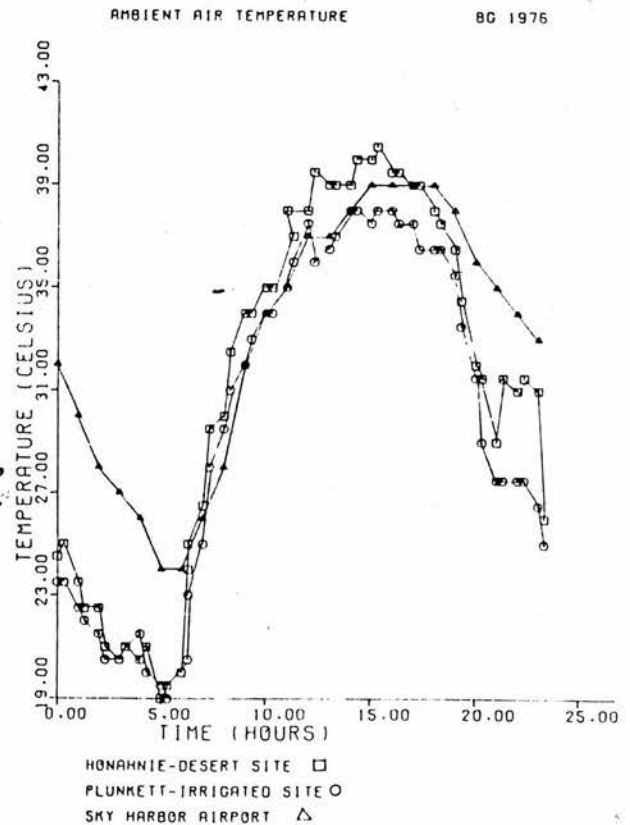


Fig (3.89) The Arcadia district where productive citrus orchards give way to lush residential neighbourhoods. Note how tree plantings accent the gridiron land divisions. In contrast is the area in the lower right, developed without flood irrigation but with desert landscaping (Cook, J., Landscaping for microclimate advantage in arid-zone housing) (Golany, G., ed., "Housing in arid lands", London, 1980, p228.

Fig (3.90)

Ambient air temperatures at desert, irrigated, and airport sites, Pheonix, Arizona. Data collected clearly show that the amount of vegetation around a dwelling unit definitely lowers ambient air temperature.

Interestingly, the night-time minimum at the airport is well above the desert or irrigated site because of the suburban landscape around the airport (Microclimate, Architecture, and Landscaping, p4.20 (Ibid, p233).



lower incoming radiation, had a higher net radiation on a daily basis. Thus the concept of planting vines on the wall and shading with vegetation close to buildings may not be advantageous because it affects re-radiation and does not allow surfaces to lose heat at night.

In brief, the study indicated that the effect of heavy irrigation, for instance, requires a certain scale to be viable; the dimensions of a neighbourhood of perhaps several hundred acres, are necessary to optimize the microclimate results of a heavily irrigated landscape. Similarly, large areas of open desert development using only native plants to maximize reradiation on a neighbourhood basis may also be required for a positive microclimate effect. Moreover, the large scale of most of the open spaces of the E.N.T. exacerbates the problems. It makes the function of plant material to modify the microclimate difficult to achieve within residential areas. Also, higher wind speeds as a result of the open areas will increase evaporation and water loss, which may damage plants by whipping and dehydrating them.

In addition, and perhaps most importantly of all, the recent planting concept of the E.N.T. is not affordable in terms of the desert water budget as will be examined in the following section (3.3.3 Water). The amount of heavily irrigated landscape within the city must be strictly limited to a total consistent with both economic and technical considerations.

The need to conserve water is not the only factor which limits the heavily irrigated, lush green landscape; poor soil conditions are also a critical factor. The soil conditions of 10th of Ramadan and Sadat city are a main problem due to its salinity and its natural components. In spite of this, numerous highly irrigated green areas have been proposed, to be created by replacing the desert sand with clay soil. Thousands of tons of top soil have been introduced from the Nile Valley,



with three million Egyptian pounds being paid for clay soil for the approach area to Sadat city (Fig (3.85) above). The common way of creating a green area is by covering the desert soil with 30-50 cm of clay soil without treatment or mixing with the desert soil (Fig (3.91)), then the conventional techniques and practices of cultivation in the Nile Valley are used to spread seeds or transplant grass over the area using surface irrigation techniques. This method creates several ecological problems in the desert site. Most clay soil material has been taken from clay deposits which accumulate in drainage channels of the Nile Valley and this material has a high salinity level. This is now the most common source of clay since a new law prevented the degradation of agricultural top soil. With the surface irrigation technique, the clay layer on top of sand will dry up more quickly than the sandy soil beneath (Chapter 2 - Soil) (Fig (2.29) above). The clay layer will hold water in its upper part and prevent water reaching deep roots. The dissolving salt will rise to the clay surface and concentrate there after the water evaporates. The large volume of surface water required and the high evaporation rate leads, over a period of time, to a build-up of salinity in most of the E.N.T. green areas. Fig (3.92) shows one of these sites.

It is clear that the recent E.N.T. planning concept and the techniques for achieving it is illogical. A desert should be treated as a desert and no silt, clay or manure should be imported to a desert site from other areas. Technologies, practices and plant varieties appropriate for a desert landscape would be expected to be quite different from those adopted in the Nile Delta and Valley [30].

### **Planting design characteristics**

The static form dominates the landscape in the form of tidy grass and shaped trees. The planting becomes like sculpture, moulded and



Fig (3.91) Thousands of tons of clay soil have been introduced to the Sadat city area (photo by the author).



Fig (3.92) Remarkable quantities of salt have accumulated on the surface of the imported clay soil - 15th of May new city (photo by the author).

shaped and as unchanging as the architectural setting in which they are situated. This type of landscape requires never-ending effort to maintain and service it.

Some types of urban landscape need this kind of static landscape form, but this will be limited areas or locations to within the city centre or specific areas.

Unfortunately, the natural landscape concept is almost absent from the E.N.T. sites. This concept is rooted in an ecological view of plants. It provides a diverse environment, requires less energy and effort to keep up and is the ideal approach for the landscape of the desert E.N.T. The landscape of the E.N.T. should blend impressively with its surroundings and the desert should sweep up to the cities in a natural way. The natural desert landscape, together with its man-made counterpart, should occupy the main part of the landscape in the desert new towns.

The natural desert landscape concept could be achieved by different means and scale. On a small scale, is possible to achieve very pleasing effects by the use of desert plants with road formation and gravels of various colours providing ground surface texture. Fig (3.93a and b) shows the courtyard of the D.D.C. Most of the plants will require almost no irrigation after allowing them a year to become established. The rest of the landscape has been left in its native state, studded with existing desert growth which requires no maintenance.

On a large scale, the natural desert landscape should be started by creating an overall framework with fast-growing pioneer species adapted to arid conditions. This will create shelter, shade and screening for the intermediate phase plants which will ultimately replace the pioneers. The final phase will concentrate on slow-growing shade tolerant species which will be long-lived. This new microclimate will afford



a



b

Fig (3.93) The courtyard desert landscape concept of the D.D.C.

- a) Agave spp. and (Mesembryanthemum with the native gravel and sand of the site in one scheme.
- b) Opuntia dillerii and (Mesembryanthemum ) being grown in desert soil and requiring little watering.

(Photo by the author).



some protection to more sensitive plant species, encouraging them to grow [31].

Large areas of trees planted tidily (wooded landscape) could contribute to the improvement of the environment in urban areas of the E.N.T. The creation of urban forest (wooded landscape) based on the principle of managed succession has been pioneered by the Dutch and has since been developed in Britain for housing and land reclamation [32]. Trees absorb radiation and regulate humidity and temperature by transpiration of water. The wooded landscape requires considerably less upkeep than does a more conventional landscape. In the E.N.T. landscape construction, there is a large difference in cost between establishing an area with grass or with trees ( $1 \text{ m}^2$  grass = 7 E.P.;  $1 \text{ m}^2$  trees = 1.30 E.P.). At the same time, there is a successful example of cultivating 80000 wood trees in 20 feddans north of Sadat city (Fig (3.94)), along with some fruit trees which were planted in native soil without any treatment and watered by drip irrigation (Fig (3.95)).

The wild desert woody shrub is a good plant material to use as ground cover to stabilize soil. Plant material to be used as ground cover should be as self-reliant as possible and the wild desert plants are a good source for this element - they are adaptable, green and pleasant to the eye as well. They can grow only where they receive sufficient water. This type of ground cover could replace grass in some areas of the E.N.T., for example the approach area of Sadat city (Fig (3.85a) above), or the sides of main roads. The wooded landscape concept could occupy these areas and transform the city environment.

Finally, a balance between hard and planted landscapes should be maintained by means of evaluation of the site characteristics of the desert new town. Comparison of the cost of irrigation equipment with that of hard materials should be made from the practical and functional





Fig (3.94) 20 feddans of Casurina trees-north of Sadat city. More than 80000 seedlings of casurina have been started in the D.D.C. fields since 1979 (D.D.C. "D.D.C. Report 1985, American Uni., Cairo, 1985, p29).



Fig (3.95) Successful cultivation of olive, palm and orange trees in the desert soil of the Sadat city area with the drip irrigation technique (photo by the author).

aspects of the space.

The characteristics of the shelter belt concept which is proposed for 10th of Ramadan and Sadat city are impractical. Wind blown dust is a severe problem in E.N.T. in desert areas. The lack of surface vegetation enables strong winds to collect a heavy dust load and when the wind passes over the city, its velocity is reduced and a thin layer of dust descends. The idea of using a shelter belt of two rows of 25 m each with a distance of 200 m between them in 10th of Ramadan (Fig (3.31) above) or a shelter belt 100 m wide in Sadat city (Fig (3.57) above), both of which are proposed to protect cities in a desert area with widths of 10-12 km), is absurdly inadequate.

The traditional desert settlements with their compact urban form which is surrounded by and integrated with a productive green area is a good example to follow. Fig (2.56) and (Fig (2.63) above show the palm grove area around the urban form of Siwa Oasis providing a real and effective protection against the harsh desert environment. This concept could be applied in the E.N.T. with different types of productive fruit or wood trees. In fact, plants with economic or productive benefits seem to have higher values than those that do not. A plantation of 8-10 years in age can produce useful timber. (Casurina gave  $0.3 \text{ m}^2$  after 10 years in the north of Egypt; one feddan supports  $400\text{-}500 \text{ m}^2$ .)

New land reclamation areas are a good means for providing a real protection for the E.N.T. This type of land use also stems from the ancient forms of agricultural landscape or urban space in the traditional settlements which were created from environmental, social and economic necessity [33].

The Salhia Project, north of 10th of Ramadan is a good example of the previous concept in modern terms. The aim of the project is agricultural, but the planning concept is interesting. Hundreds of

circular irrigation units produce round green fields located in a desert area. This method is similar to that used in the Libyan desert at Kufra (Fig (3.96)). They create a strong contrast with the vast surrounding sea of yellow sand. The houses for the people who work in the project are located in different groups between the green circles, which ensures an ideal protection from the desert environment (Fig (3.97)). There is, however, an argument against the idea of combining urban and agricultural use of land. Khodary says "It is a mistake to locate a town on soil reclaimable for agricultural use" [34]. This point of view could be correct for first class agricultural soil (such as the Nile Valley soil), but not for third or fourth class desert soil as in the Salhia Project. The benefits of creating a good environment for residents on newly reclaimed desert land is more important than the loss of reclaimable third class soil.

The agro-urban concept (palm grove or green circle) will naturally increase the relative humidity within the urban environment and consequently moderate its hot, dry climate. It will also reduce the psychological feeling of isolation encountered in a large arid desert and provide food for new urban areas, reducing reliance on food imported from the Nile Valley.

Another way of providing a green zone to protect new towns in a desert area where land reclamation is not easy, is by the establishment of an area of nature reserves around the new town. One of the obvious and simple methods is to conserve what vegetation there is by fencing and keeping grazing out of the city and its surroundings. An excellent example of how this could be done is Broken Hill, Australia. "In 1936, a plan was suggested to encourage natural vegetation to grow behind shelter from grazing animals. The mining company initiated the scheme, which has been extended to create a pleasant belt of natural vegetation.



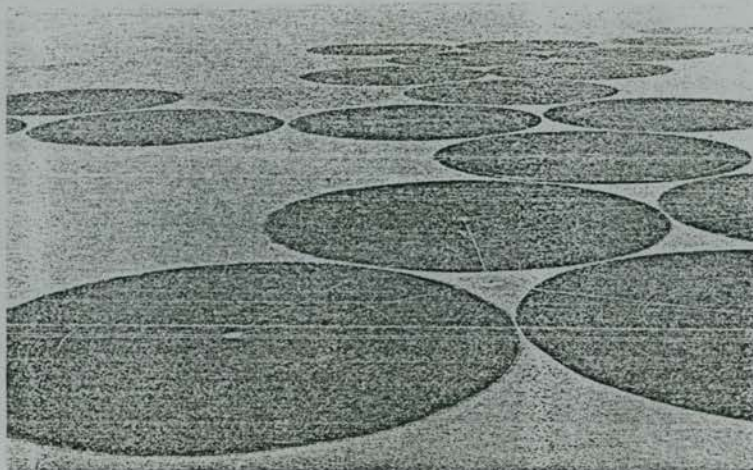


Fig (3.96) Centre pivot irrigation units create "green circles" in the Libyan Desert at Kufra. Each circle represents 400 ha of crops (Adams, R., "Dry land: man and plants", 1978, p71).

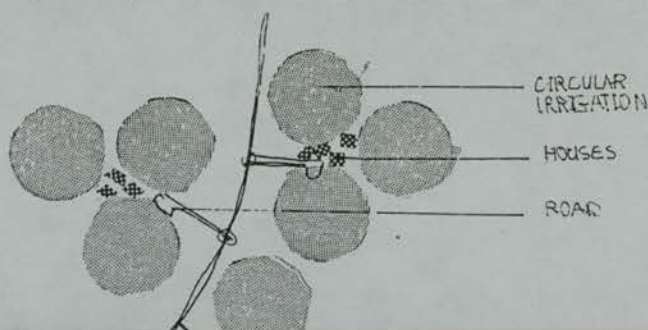


Fig (3.97) The farm planning idea of Salhia Project. Houses are located for each group close to the green area which belongs to them (sketch by the author). Fot ("The Economic Framework of Land Reclamation in Egypt" "Egyptian- British Trade", London, August, 1984, p22").

The city now looks like a giant oasis in desert country" [32]. This concept could be achieved in the northern part of the Egyptian desert where there is sufficient rain for developing wild plants. Besides providing protection for new desert settlements, the area of natural reserves will represent the characteristic (natural) features of the desert environment as closely as possible. "Wadi Rischrash in the Eastern Desert was protected from 1900. In a few years time, vegetation was so dense that it looked like an irrigated oasis. Wild desert mammals took refuge there for the breeding season. The reserve was destroyed in 1952" [36]. In addition it should be of sufficient expanse to accommodate and preserve the threatened and endangered species of plants and animals, as it provides suitable facilities for generic and species variation within its grounds. It also has educational value, encouraging the reintroduction of animals and plants which used to be common in the region but are now rare or absent. It could be in different forms such as desert parks or zoological gardens. In general, providing a green zone by means of land reclamation, productive woodland or nature reserves around the E.N.T. to provide protection for them should be undertaken concurrently with the development of the city, even if this would involve diverting public funds from the development of the city.

### **Plant selection**

The large scale of E.N.T. development in desert areas has stimulated the desire for vegetation, especially ornamental trees and shrubs, to soften the built image. New design criteria, whether for flowers, leaf shape or colour or plant form are selected and, due to ignorance of indigenous plants, more encouragement is given to the importation of several dozen plant species than to the production of indigenous plants (see Index - Plants). Most of the plants specified in the E.N.T. sites



are initially chosen through a combination of agricultural engineering and horticultural commonsense arising from experience of plants from the Nile Valley.

The selection of indigenous plants, rather than introduced species, is of great importance in the fragile arid lands, where the preservation of ecological balance is a prime necessity.

In this section the research is going to examine the urban plant communities for the E.N.T. There are three general groups of plant community which can be identified within any city. They are as follows:

a) Introduced plants

This group of plants is the product of horticultural science and almost entirely dominates the landscape site for all the E.N.T. Most of the selected plants in the E.N.T. do not quite satisfy the environmental and cultural demands of desert conditions. A wide range of these plants have been proposed for 10th of Ramadan and Sadat city (see Index of Plants), but in fact very few have been commonly used, for example Ficus nitrada, Delonix regia. Most of the listed species are imported and unsuited to the harsh desert conditions; this even applies to local ones grown in completely different environments in the Nile Valley's nurseries. The physical conditions under which plants are grown in these nurseries include uniform standards of soil, moisture and temperature. Therefore they require soil modification and special treatment to be cultivated in desert areas. Clay soil has been introduced from the Nile Valley and additional water has been required to help them to adapt in their new habitats. In fact, most of the plants in the E.N.T. have been brought into the desert on a trial and error basis. From the site observation of the landscape of the E.N.T., it can be seen that most non-adapted species die within a few months of planting. The less adapted trees and shrubs still require huge amounts

of irrigation to survive. "There is little local experience and availability of species requiring less irrigation" [37]. The problems of plant selection extend to choosing the wrong species and using them in the wrong places.

In large scale projects like the E.N.T., the policy should be to select the species for the site conditions, rather than to modify the site to fit the species as has happened in most of the E.N.T. sites. At the same time, the plant being introduced should come from the same phylogeographical zone, unless it is required for a particular function which cannot be satisfied by regional flora.

Here the selection of plant material should be based on the ecological criteria of the site itself. Therefore, the construction of local nurseries in the desert new town site is an essential stage in order to provide for the new city landscape plant material which will be more adapted to the local environment. At the same time the nursery sites could occupy the major open spaces of the new town ensuring lush green areas within the city.

Moreover, the selection of plant species in order that they do not affect the habitat will depend on a detailed knowledge of their history, evolution and potential before a function or target can be achieved. This means that further research is needed to cover and provide guidelines for desert areas. Adams has concluded that the main characteristics for arid plants are as follows: they should be heat, drought and wind resistant; they must, in many cases, be resistant to salinity; plants chosen for urban use should serve an economic as well as ornamental function wherever possible [38]. In fact, many native plants have adapted to Egyptian desert conditions and the obvious solution to the existing problems might seem to be to adopt these plants for landscape.

b) Native or indigenous plant communities

Native plants are defined as not known to have been introduced by any human agency [39]. Perhaps initially a lack of knowledge of the native flora caused some of the problems which led to the importation of plants from other regions. This lack of knowledge is mainly a result of the lack of cultural value given to these wild plants as has been discussed in Chapter 2 (Culture). There is no wild vegetation which is of any significance to the people of different classes. An agricultural engineer who is responsible for landscape planting for 5th of May new city was asked why he did not use the native desert plants in the main planting scheme. He replied "We did not like to use desert plants because it will remind the people of the surrounding desert". This comment sadly reflects the lack of effort made to create an environmental awareness among Egyptians in different sectors and classes.

Most of the plants used in E.N.T. are exotic. They have been introduced to Egypt and have become more popular amongst gardeners and nurseries than the native species which are disappearing as a result of overgrazing or destruction by man. "Landscape designers working in the region should remember this history of ecological degradation and try wherever possible to re-establish the native vegetation. The task is made difficult by the fact that inhabitants of the region are often unaware of ecological history. They believe their country to be naturally barren. Egypt once possessed considerable forest resources in the Eastern Desert and the Sinai. The forests survived down to the twelfth century and were protected by a complicated system of forest laws. These laws were not enforced during the Ayoubid Dynasty. The trees were felled and have never been reestablished" [40].

There are some thousands of Egyptian native species out of which at least some hundreds can be considered suitable for the various require-

ments of the landscape architect. "It is necessary to evaluate each community's native flora, not only in terms of the individual qualities of each plant, but also in the wider concept of their use in landscape work" [41]. Some of these indigenous plants have aesthetic value and economic returns. An attempt was made in the Desert Development Centre in Sadat city to grow some of these species. Fig (3.98) shows Acacia saligna which has been used as a fodder plant for livestock and, at the same time, has very attractive characteristics. Fig (3.99) shows another example, Atriplex sp. which has great value as a fodder plant and, at the same time, reduces the soil salinity by absorbing salt from the soil transforming it into undissolved salt on its leaves.

There have been recent significant examples of the successful use of native species in America, Australia and Europe and, although the situation in Egypt is different, the principle of using native species should have a universal application. There are a wide range of native species - from annuals, biennials and perennials to trees and shrubs, that could be developed in most of the E.N.T. sites. Some of these species have been collected from the E.N.T. sites and have been identified by Dr. S. El-Nagar (plant taxonomist) and are listed in the Index of Plants.

Fig (3.100) shows some of these wild plants which developed and flourished in the area between the two main lanes of the Cairo-Ismailia desert road near 10th of Ramadan. These plants grew when they received sufficient run-off water collected by the surface of the main road and when they found good soil conditions. They depend completely on rainfall, which is about 36 cm/year. These wild plants stabilize the top soil and prevent dust from being blown up. They help prevent car headlights at night from distracting drivers. They have the aesthetic value and encourage wild life in the new cities by acting as a natural





Fig (3.98) Acacia saligna has been used as a fodder plant for livestock and, at the same time, has very attractive characteristics (photo by the author).



Fig (3.99) Atriplex spp. has great value as a fodder plant and as a means of reducing salt from the soil (photo by the author).



corridor.

These wild plants could be developed with a little help from man through the intended concept applied for the new desert towns. The land awaiting development and the areas at the side of the main roads could be covered with these wild plants by providing sufficient water by means of sprinkler irrigation. Even the ephemeral plants can be used on a large scale to stabilize the soil. "The ephemeral plants germinate by thousands and cover the entire desert as a green or coloured carpet during the flowering period. They are much less tied to a particular habitat growing anywhere provided that the ground remains damp for a long enough period" [42]. The indigenous plants faithfully reflect the passing of the seasons, while exotic species may be introduced specifically for their non-seasonal characteristics.

In contrast, the static conventional heavily irrigated landscape has been applied in the same area between the two lanes of the desert road near the 10th of Ramadan approach (Fig (3.101)). Clay soil has been introduced to create a green carpet of grass, which has failed since the grass died due to high salinity and lack of water. Large quantities of water are needed to support the cultivated plants by open surface irrigation. This landscape concept needs a high level of maintenance and cost to keep close to the proposed design especially in highway areas.

In general, any new urban development in desert areas would necessitate the use of indigenous plants. This requires a change in attitude from normal horticultural practice to a sound ecological understanding of the site and its locality. "Native plants are used as they are found to recreate dynamic communities (including their fauna), rather than unchanging garden composition. This calls for a far greater understanding of the ecological factors of both the plant and its relationship to



Fig (3.100) Wild native plants grow in the central reservation area of the Cairo-Ismailia desert road (Fagonia spp., Salicornia spp., Lycium spp., Zygophallum spp. and Hyoscyamus spp.) (photo by the author).



Fig (3.101) The static, conventional, heavily-irrigated landscape for the same central reservation area, Cairo-Ismailia desert road, beyond 10th of Ramadan (Myoporum laetum (shrub), Washingtonia robusta (palm), Ficus nitida (tree), Nerium oleander (shrub) and grass (photo by the author).

natural conditions, which cannot come from textbooks alone. It must be supported by prolonged field observation" [43]. This point is critical especially in the arid developing countries "Middle East" where there is little understanding and no practice of ecological principles.

"Moreover, when wild plants grow naturally they are generally in very low density communities (Fig (3.102a and b)); when used in higher concentrations, as in most urban situations, they require a correspondingly greater quantity of water. Thus when wild plants are used for their visual and functional quality in an urban setting, they are typically irrigated beyond the level of mere desert survival. For this reason the use of native plant material does not eliminate the need for irrigation, although it is certainly true that its lower transpiration reduces the amount of irrigation" [44].

c) The naturalised urban plant community

"These are the plants that have adapted to city conditions without the assistance of man. The city offers a wide range of sites for these naturalised urban communities" [45]. There is no sign that this type of plant community has formed in the desert E.N.T., but some plants will take advantage of the special microclimate created by the new cities in the future. They become a valued resource for establishing vegetation on poor sites and sterile soils. They could be used to enhance and modify urban soil and provide alternatives to importing soil.

**Planting objective**

The recent concept of the landscape for the E.N.T. as has been discussed before is based on leisure needs rather than functional ones and is an unrealistic concept, especially for a developing country like Egypt. The conventional landscape provided by E.N.T. has a high management and maintenance cost, has little diversity and provides no economic returns. "The literature ignores the vernacular forms of agricultural





Fig (3.102) a) Wild plants growing in very low density communities in a natural area.

b) In an urban situation, they are used in higher concentrations.

landscape or urban spaces that were created from environmental, social or economic necessities" [46] A symbiotic relationship is found between agricultural land and the settlement, the former producing the food and raw materials, the latter returning by-products such as organic wastes back to the land to enrich the soil. It could be described as a man-made community of plants and animals interacting with soil and climate.

Many of the open spaces of medieval arid area cities were employed for growing food or medicinal herbs and were designed for pleasure as well as utility. Siwa Oasis is a remarkable example in the Egyptian desert of an independent community. The farm land has integrated with the urban form physically and functionally. The approach of urban landscape design which derives its inspiration from the functional landscape of the countryside, must be introduced to the E.N.T.'s open spaces in different scales and means.

For example, industrial land, public works and vacant lots take up very large areas of the new cities. These areas remain sterile or ineffectively used and are always uncultivated, serve little productive purpose and are considered as sources of pollution. Even when they are planted it is with grass and ornamental trees which provide no return. "It has been calculated that the rate of energy for the maintenance of some 16 million acres of lawns in America exceeds the rate for commercial production of corn on an equivalent amount of soil (cultivated area) (Faltarones Institute 1979)" [47]. The industrial areas, in many cases, are fenced and inaccessible to the public. They are the ideal place to be used as productive landscape which could be managed and maintained under the supervision of the industrial company or the person who owns the land for little or no cost and perhaps for some benefit. For example alfalfa - which is beneficial to soil improvement, provides green cover and is a good fodder crop for livestock - could replace the



grassed area which has no economic function. Sixty feddans of sandy desert soil near Sadat city have been cultivated with alfalfa by the D.D.C. (Fig (3.103)).

Residential open spaces are a considerable resource for urban farming. They could include semi-private gardens, apartment balconies, roof tops or in fact any space where individuals can grow a few tomatoes or lettuce [48]. China gave perhaps the best example of urban food production. At least 85% of the vegetables consumed by urban residents (20% of the total population) are produced within the urban municipalities [49]. The courtyard house is the ideal and most appropriate open space for food production in desert areas. The same concept of planting which has been used in large scale production landscape could also be used on a smaller courtyard scale.

The attitude of rural people in the Nile Valley towards plants is to look on them as crops, orchards and fodder for livestock according to their time-honoured function. At the same time, the Egyptians who live in urban areas look to the countryside as a recreational area providing a fresh environment and food production. Therefore, the application of a productive landscape concept may find acceptance by the E.N.T. resident coming either from the country or the city.

This concept will provide a self-sustaining land use with considerable public benefit in terms of both produce and amenity value. It is the same kind of landscape which has been used in the countryside of the Nile Valley.

However, from a cultural viewpoint, especially in Egypt, it may appear that the application of a productive landscape concept is not appropriate in every area. It may not always be preferable to encourage fruit growth in some places, and there are a number of potential problems associated with this: children climbing trees, for example, in the

central reservation of highways could be a serious risk both to themselves and others. Unfortunately, the Alexandria-Cairo desert road has been cultivated with olive trees near Sadat city. Also, landscapes of orchard trees in a desert area are often dependent on sophisticated maintenance especially during the establishment stage and therefore need to be protected from excessive public access. The concept of productive urban land, however, introduces the notion that plants which can be eaten can also have a role in landscape design [50].

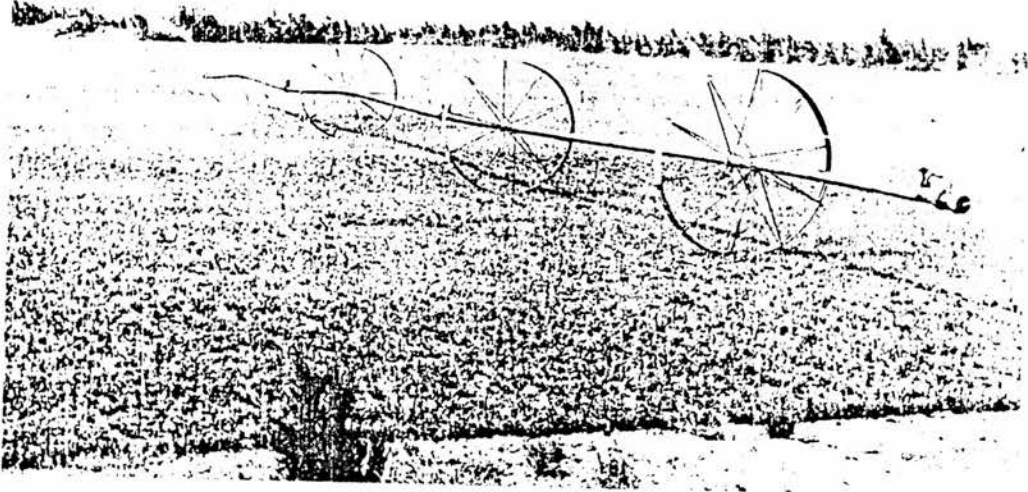


Fig (3.103) Sixty feddans of sandy desert soil has been cultivated with alfalfa, Sadat new city. Average yield in the first year of establishment was in the range 16-20 ton/feddan and was expected to increase during the following two years (D.D.C. Report, p33).

### 3.2.3 Water

(See Diagram 3.1b above.) The importance of water for new desert towns stems from its crucial role as the life source in desert regions. From a very practical viewpoint, new communities need water for survival just as they require food and shelter. In landscape design, water may be used as a purely aesthetic element or it may be employed for utilitarian functions such as cooling the air, as a buffer to sound transmission, irrigating the soil, or for recreational purposes.

The water element will be examined here from two view points: first as a general factor affecting the landscape of the E.N.T.; second as a detailed landscape element within the E.N.T.s.

#### 3.2.3.1 Water as a general landscape factor

The effect of water in the landscape of arid areas has been discussed in Chapter 2, but here the research aims to examine the existing problems for water factor in the E.N.T. as follows:

##### **Water consumption**

The water consumption of 10th of Ramadan and Sadat Cities has been illustrated in Tables (3.4) and (3.7) above. The direct human water consumption is rarely a critical factor. The amount of water which people use is relatively small in comparison with industry and agriculture. Agriculture and industry depend on relatively copious water reserves, and they can be critically affected by fluctuations in supply.

The establishment of the new settlements in desert areas necessitates a wise water policy to maximise development with a minimum use of water. The most obvious way to conserve water is by not using it profligately, but in the existing E.N.T.s this is unfortunately not done.

For example, surface and flood irrigation techniques dominate the

irrigation system for all E.N.T.s. Fig (3.104) shows a part of the green belt of 10th of Ramadan where flood irrigation by means of channels has been applied. This is extremely wasteful in the sandy soils of desert areas. "Plants typically are only able to use 30-60% of water supplied by flood irrigation" [51]. At the same time, with the large volume of water required and the high evaporation rate, the method is extremely wasteful and, over a period of time, leads to high salt build up.

Flood irrigation is not the only reason for excessive consumption of water; the commonly proposed, heavily irrigated spacious landscape concept is also as contributory. It was found that there is a marked difference between the proposed and actual water demand for irrigation on the same project. For example, the main report of 10th of Ramadan 76 states that the water required for green areas is  $120,000 \text{ m}^2/\text{D}$  (Table (3.04)). On the same page (p75), it was noted that the previous figure was calculated according to studies made in El Nasr City, a new district of Cairo with similar soil and which show that for every feddan (one feddan = 0.42 ha) of parkland cultivated on sandy soil a daily supply of about  $50 \text{ m}^3$  maximum would be required. As it is known that the total green area of the city is 3,000 ha = (7,143 feddan), the water needed for irrigating these areas will thus be  $(7,143 \times 50)$ , that is  $357,150 \text{ m}^3/\text{D}$ . This means the actual amount of water required for irrigation is three times that proposed ( $120,000 \text{ m}^3/\text{D}$ ). Therefore, two thirds of the city's green areas could not be cultivated without additional water which was not planned for and this excludes shelter belt areas from these calculations. Similar circumstances have been a feature at Sadat City where the green area covers 1.875 ha (= 4,445 fed), and the proposed figure for water demand for irrigation is  $123,000 \text{ m}^3$ . The actual water needed is  $4,445 \times 50$  or  $223,212 \text{ m}^3/\text{D}$  or almost double the proposed





Fig (3.104) Flood irrigation technique has been used in the shelterbelt area of 10th of Ramadan (photo by the author).

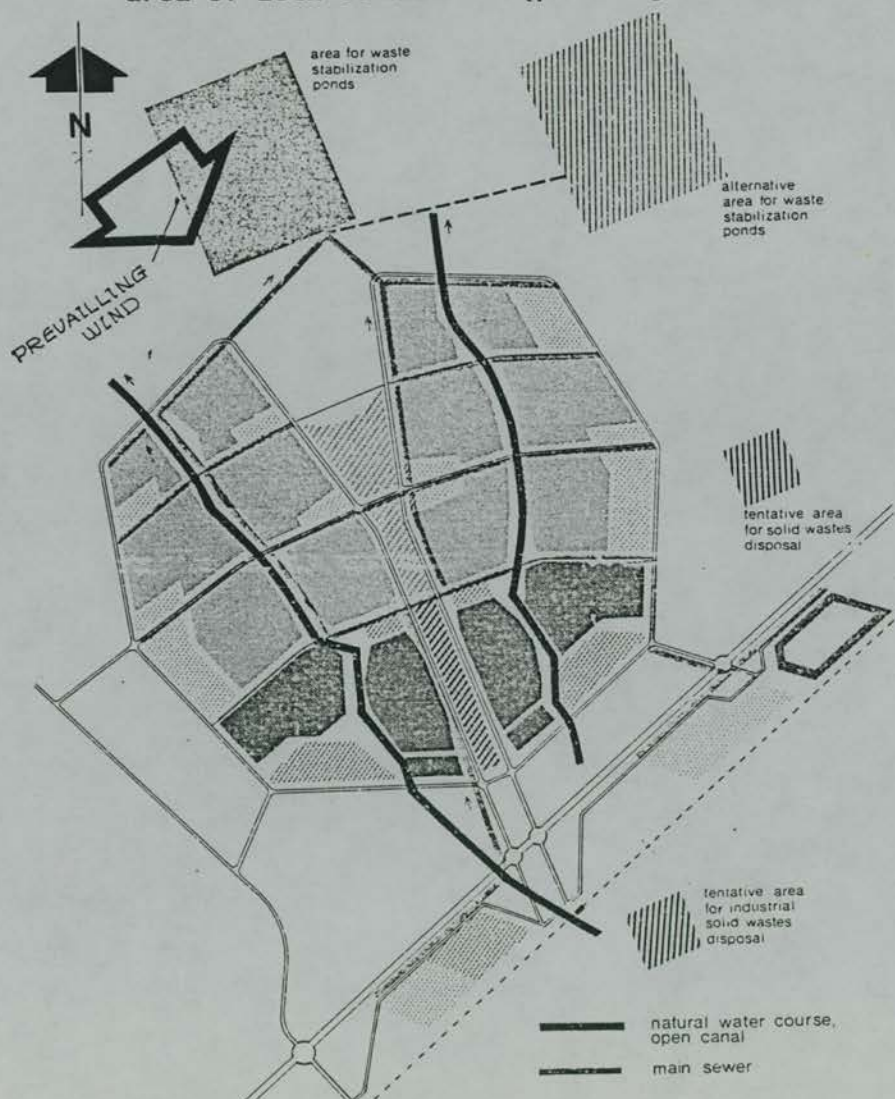


Fig (3.105) Sewerage and solid wastes of 10th of Ramadan (a fundamental mistake in planning to locate sewage works in the north part of the city where the prevailing wind comes from the north) (SWECO, op.cit, p77).

figure.

The striking aspect of the water demand for the two case studies is the figure of domestic consumption: both Sadat and 10th of Ramadan City have been designed for 500,000 people, but the domestic consumption for Sadat City is 286,000, while that for 10th of Ramadan is 157,000. This would seem to indicate unrealistic forecasts because the water consumption figures should be the same for 500,000 people wherever they are.

### **Basic approach**

As mentioned in Chapter II, Egypt suffers from a scarcity of water and as the E.N.T.s are growing the water consumption pattern is increasing year by year. Since the water problem in Egypt is significant, it is important to consider that portion which relates to the proposed comprehensive plan in the E.N.T. areas. The total green areas and the planting concept applied along with their water demand, must be analysed very carefully for each project together with the best estimates of available water. A fundamental starting point for a landscape design must be to identify and evaluate the water supplies available. It is no use at all to complete a visually superb design and then calculate the water requirement, only to find that the water supplies are not adequate. This may seem an obvious point, but most of the landscape designs for the E.N.T.s have been completed on this erroneous basis and have therefore surprisingly never been implemented [52].

A careful management of wind and of temperature extremes minimizes the need for water in arid areas. At the same time every plant in man-made desert communities should serve at least one function as efficiently as possible, that is with a minimum use of water [53].

"In general, the clear fact emerges that if water is limited in quantity the energy needs to acquire and distribute it must be conserved, and therefore must use less water" [54]. The water policy for the

E.N.T.s plan should therefore manage to establish minimum water requirements for landscape plants in desert areas.

### **Water supplies**

There are different types of water supplies which are used in the E.N.T. in different quantities and of different quality.

The largest portion of water demand for the E.N.T. is obtained from surface water, the River Nile being the main source of surface water. The Ministry of Irrigation has indicated the future maximum figure for each recent new city: in 10th of Ramadan it is 400,000 m<sup>2</sup>/D to be obtained from Ismailia Canal before 1990; for Sadat City there is no actual figure, apart from a note that water from the Beherry Canal may be used. E.N.T. developments have no clear policy regarding surface water [55].

As has already been discussed in Chapter 2, Egypt may face a water crisis at any time as a result of the drought in the Ethiopian Highlands. Since this study has been analysed there has been no clear cut policy by the Egyptian authorities to clarify the situation. The task of conserving the Nile water is essential under present circumstances. One way of conserving water is to ensure the most efficient use of existing supplies. The Egyptian authorities should try to develop general planning policies and basic growth management strategies before they encounter specific problems with the shortage of such natural resources as water.

Some of the E.N.T.s have depended on ground water in the first stage of development. In Sadat City, the major supply is ground water: the well field system supplies water from the aquifer to the ground storage tanks. The rapid development of industry and urban areas has imposed a severe demand on the available ground water supplies: during the first stage of development the water table dropped 10 m. The

adjacent farming areas, such as Wadi el Natrum, have been effected by the withdrawal of ground water by the Sadat City area. Many farming areas have begun to dry up, and expensive pumps have had to be purchased to draw water up from increased depths. Many of the local farmers have been unable to afford to do this and so have been unable to water their crops. The anticipated effect of such continuous water withdrawal over 25 years is expected to be a further water table drop of approximately 32 meters. This will cause serious problems.

The use of ground water should be considered carefully. Ill-considered use may lead to a distortion of the ecological balance in that more water is being used than is being naturally replenished. Water, an otherwise renewable resource for all practical considerations, thus becomes a non-renewable and depleting resource so that the pumping of ground water becomes synonymous with the mining of oil [56]. A complete dependence on ground water for new and expanding development such as Sadat new city is therefore a great risk as the local aquifer in the area is recharged from surface water courses in the Delta, which are dependent upon the Nile.

Small amounts of rainfall characterize desert areas around the E.N.T., but rainstorms can be sudden and violent, and consequent surface runoff is rapid. Because these large quantities of water occur infrequently, most of this runoff is carried in open drainage ways rather than storm sewers. This is a valuable source of water which is not generally utilized in the E.N.T. sites.

The conservation of rain water by means of a catchment area, to collect the water and concentrate it into a controlled area, or into a storage facility for later use, is becoming a viable alternative source of water for arid regions.

At the same time, runoff from urban areas should be considered. It

has been estimated that the runoff from urban areas which are completely paved or roofed might constitute 85% of the precipitation [57]. In desert areas the figure may be lower, but it does not seem sensible to lose this type of water source in a desert area and it should be utilized. Fig (3.100) above shows how wild plants have developed and flourished when they received a sufficient supply of water which had been collected from the the surface runoff of the Ismailia-Cairo desert road.

Part of the available water supply is used water, that is, waste from residences, offices, industries and perhaps even irrigation water, collected by underground drainage systems. This source of water has been recommended for use if possible in most of the E.N.T. sites. In Sadat City for example it is proposed that treated waste water should be used for shelter belt irrigation [58]. These may be entirely dependent on this source of water in which case they can only be planted when the urban areas and industrial areas are large enough to provide the necessary supply. Since much of the planting (especially shelter belt plants) must be established well before people can move onto the site to live, this system is scarcely practicable unless supplementary water is available in the early stages.

The progress of the construction of residential units is always slow. For example, 35% of a housing area may be completed in the first stage of development but only 15% of the figure being occupied. This means that the production of sewage water will be delayed.

In 10th of Ramadan, a big mistake has been made be locating the ponds for treating sewage water in the northern part of the city (Fig 3.105). A distance of one kilometer is not sufficient to prevent bad smells from reaching the city. The dominant wind comes from the north for most of the year, and the hot weather increases the decay of organic



material, resulting in the strong odours being carried south by the wind.

The fullest use of treated water is imperative in arid areas; as well as its importance as a source of water, it enriches the soil. It could form the basis for urban agriculture and a productive landscape. In developing countries where there is a lack of technological experience, it should be applied carefully. Ponds should be located downwind and separate from the city utilizing buffers of an appropriate distance to avoid noxious odours reaching the city. In general, the use of treated sewage water will not by itself solve all the problems. "The clear fact emerges that, if water is limited in quantity and the energy needed to acquire and distribute it to be conserved, we must use less water" [59].

#### 3.2.3.2 Water as a detailed landscape element

Water as a landscape element has a number of unique distinguishing qualities compared with other design landscape elements, particularly in desert environments [60]. There is no evidence that water as a detailed landscape element has been properly considered in the landscape design of existing E.N.T., either on a large or small scale. There has been no correctly based design or realistic proposals for the use of water in the master plans to discuss here. This element will therefore be examined for the possibility of using it in future E.N.T.s. The visual and other functions of water in the outdoor environment in arid areas will also be examined.

From a historical perspective, most of the early cities and villages in Egypt were originally settled at the edge of the River Nile and its channels, or around the springs in desert areas. In these cities and villages, irrigation water for agriculture and the urban landscape was traditionally provided by open channels. These water elements were

always located along prominent corridors of pedestrian activity where they served as visual amenities, emphasising the nature of the place. As a result, the Egyptian attraction towards water to be used for visual and recreational use became desirable.

Today, most of the E.N.T.s have been situated in areas close to new open channels which were built to provide water for newly reclaimed land. Such channels could be used not only as water elements in the new town's landscape, but could be extended to provide water to the main part of the planting of the new city and to the agricultural zone beyond the town perimeter.

Ismailia City is a good example of applying the previous concept of using artificial open channels within the city landscape. The city is traversed, east-west, by the Ismailia Canal, formally called the Sweetwater Canal which was built from the Bulaq quarter of Cairo on the Nile to Ismailia in 1836-58 to provide fresh water to the thousands of workmen building the Suez Canal. The Sweetwater Canal has been incorporated within the city's landscape concept: the city is surrounded on three sides by parks and gardens, and has been compared to localities on the French Riviera [61]. Fig (3.106) shows the plan of the canal penetrating the urban area of Ismailia City. Today, the it has a great impact on the environment of the city and is considered the main recreation area for the city. Fig (3.107) shows the green area beyond the canal penetrating the city.

The Ismailia City and the Suez Canal region, constructed after 1859, ranks amongst those few human artifacts which have brought about major changes in demographic patterns on a national scale. The Sweetwater Canal system to feed the canal cities also constitutes a major adaptation of the natural water balance in opening up new opportunities for development [62]. Fig (3.108) shows the Sweetwater Canal running

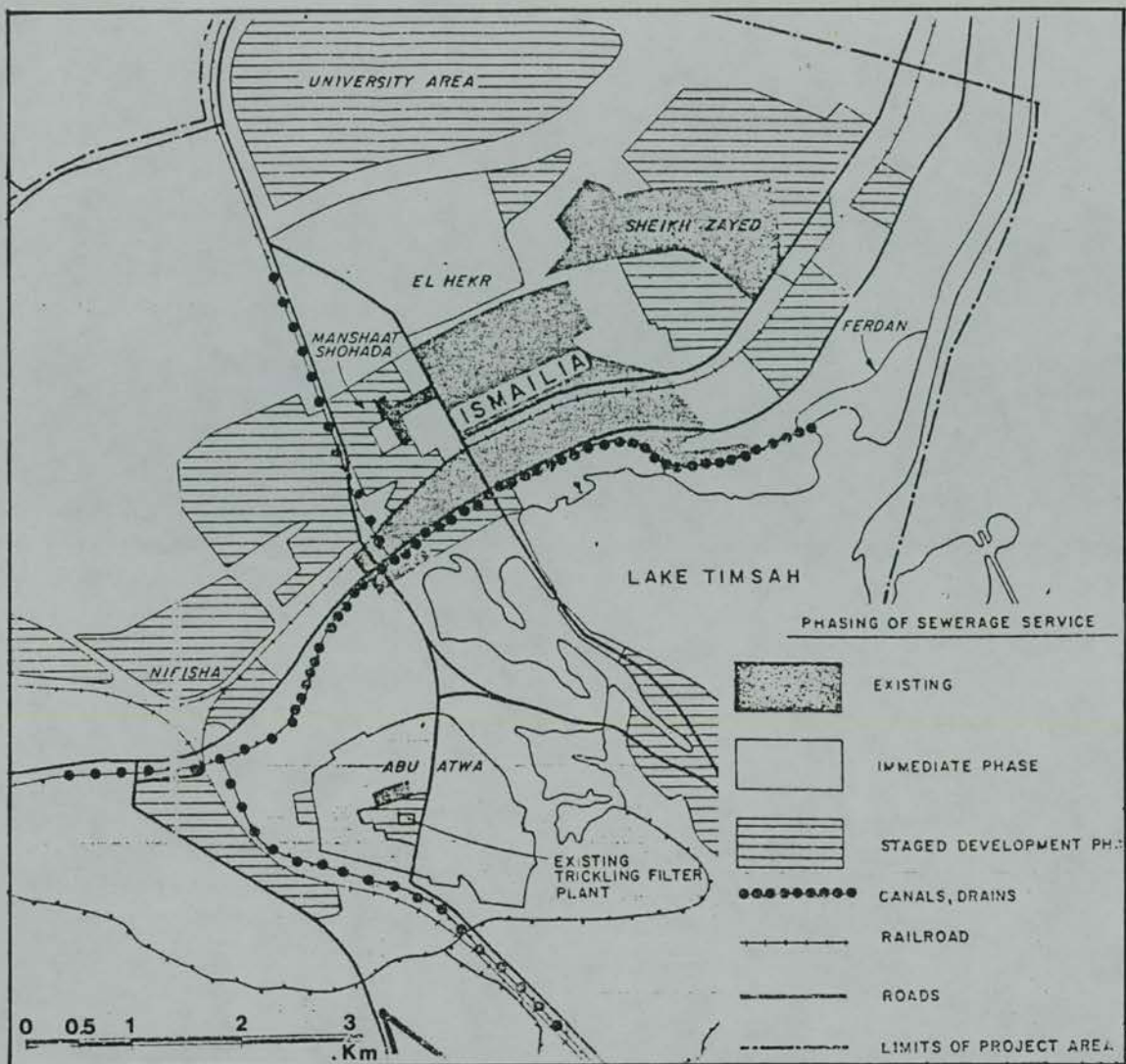


Fig (3.106) Ismailia Structure Plan. The Sweet Canal traverses the city from west to east (M.H.R., Ismailia Plan Year 2000, Report, 1976, p33).



Fig (3.107) The canal creates a lush green area which is considered one of the main recreation areas for Ismailia residents (photo by the author).





Fig (3.108) The city has been traversed by the canal and its green parkway (photo by the author).



Fig (3.109) The same canal traversed the newly reclaimed desert area near Ismailia (photo by the author).

through Ismailia City creating a green parkway beyond. Fig (3.109) shows the same canal in a new reclaimed desert area before reaching Ismailia City. The canal and its man-made landscape has an admirable impact on the environment of Ismailia City.

Within certain limits therefore, the site selection of a new town should take advantage of the water potential of the existing environment. It would for example be wasteful to ignore the opportunity of existing natural water channels when consideration is being given to the main landscape concept of the city.

Introducing surface water into a new desert city serves an important climatic function, as well as providing recreational and aesthetic enhancement. Water could have been sensibly used in this way at Sadat City if the whole site was shifted a little to the east, where a new channel is planned to service a steel mill project and reclamation areas (Fig (3.110)). The channel could have been integrated within the plan crossing from east to west in the northern part of the city. A major green area could then have followed the channel, planted even as a productive woodland and greatly helping to reduce the evaporation of the channel water. It should however be noted that this would have some disadvantages, for example additional water supplies would be required to meet conveyance losses (evaporation and percolation) from the water surface.

It would on the other hand have the great advantage of providing immense potential for urban design such as a very good recreation zone, with the water used for fishing, boating and sailing. Such a large body of water surrounded by a lush green area would modify and cool air temperature in the surrounding land areas. It could also provide physical and biological links through the city to the surrounding natural area.



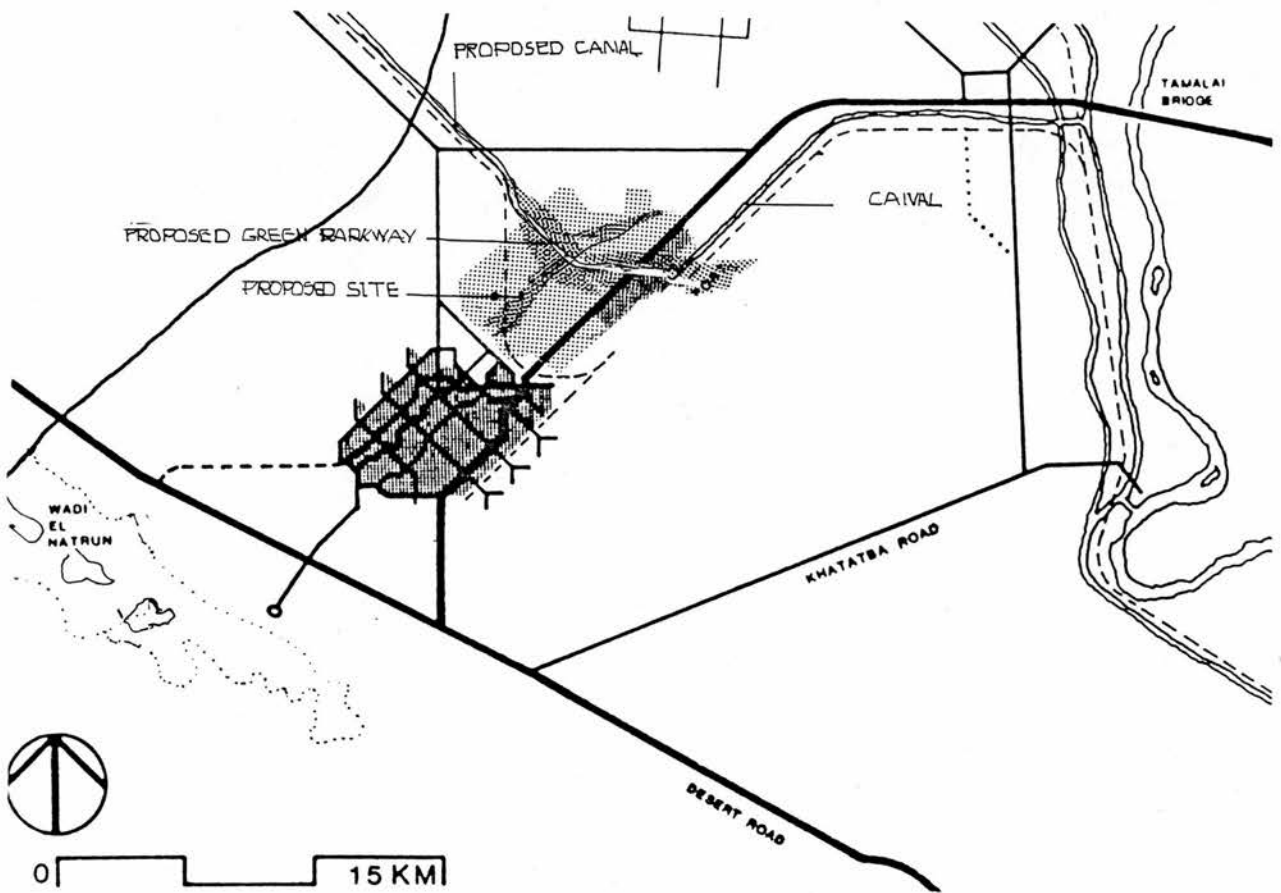


Fig (3.110) A sensible water element would have been easy to achieve if Sadat City had been shifted a little to the north-east where a new open channel had been built.

Applying such changes to an existing E.N.T. would not be easy to achieve. Most of the land forms do not allow the channel to drain naturally, but in some areas it could be considered where there is a draining area for storm water.

In conclusion, artificial water channels should be considered where possible in the site selection of all E.N.T. The land reclamation plan in Egypt is connected with the E.N.T. plan giving the necessary opportunity to coordinate the use of this precious element.

In smaller scale sites water may be used in the outdoor environment to modify the microclimate. Evaporation of moisture from a surface will lower the temperature of that surface and in turn the air temperature in its vicinity, increasing the relative humidity. In arid conditions, it is difficult to use and store water. It cannot form pools and lakes without a continuous supply. "The earliest recorded gardens are Egyptian, where the idea of paradise centred on the oasis garden. As water was the precious giver of life to man and the plants and animals he fed upon, it also became the centrepiece of his gardens. The irrigation patterned gardens of Asia, Arabia, Persia and India originated from Egyptian models and spread west through Greek and Roman invasions and finally to Spain with the Moorish conquest, as is exemplified by the stunningly beautiful garden of the Alhambra in southern Spain" [63]. "The traditional Moorish garden design with small contrived pools, tiny single water jets and channels, a few centimetres wide, exemplifies the scarcity and importance of water under these conditions, and is a model to be followed" [64]. Moreover, water could serve a visual function in the outdoor environment in different ways. The process of integrating water in the landscape for visual use should be similar to that employed for other design elements. It could be used in the outdoor environment of a desert landscape as a flat, tranquil body. Flowing water could

also be used in the form of well-defined channels which could be developed to create a form of falling water in some area. The most successful place for using water as a landscape element in desert areas is in the courtyard garden, which provides a protection from dust and high rate of evaporation. The idea of a fountain in open desert areas is alien for very good reasons. The use of water in more extravagant ways is unlikely to be successful. Finally, the use of water is appropriate and enjoyable as long as the water resource is treated with care and sensitivity [65].

#### 3.2.4 Landform

(See Diagram 3.1b.) Landform is one of the most significant elements in the exterior environment. It serves as the base for all outdoor activity. It has a great effect on the other landscape design elements including buildings, plants and water. "It can be considered a thread that ties all elements and spaces of the landscape together into a continuum that ends along the horizon or at water's edge" [66].

In spite of the fact that it has a relationship with all other elements, it is not necessarily the most important. The landform element will be examined as follows: identity of the site, visual characteristics and urban mass and landform.

##### **Identity of the site**

There are certain historic areas which almost everybody responds to with memory and pleasure. The qualities which evoke such response are generated by the relationship of man and his activities within the natural features of the area. The historical name of the area also rises and emphasises the response: it gives an identity to the place. Unfortunately, most of the E.N.T.s have been separated from their original site names. Their names have been inspired by political influences.

Not only have the new cities been divorced from their site names, they have also been designed independently of the site itself. The E.N.T.s are largely copies of plans which were produced by planners and architects who have not seen the site before and do not know about the people and their culture, working on the basis that they were designing an ideal city for a level landform for any culture. They produced plans which could be applied in any level area. It does not matter if these plans are shifted or completely transferred to other sites.

Providing an identity for such a city is an essential task for any

design. The existing name of a new city's site is an important link with the past while forming a part of the new city's history.

Ignoring the original name of the area of E.N.T. sites and giving them political names is a great mistake, because the new town loses a part of its identity. The city gets its identity from the site, but the site loses its identity when given a new name. The new residents of the new towns should be able to associate with their site emotionally and physically. The physical features of the city site should be retained and the landscape scheme should be employed to achieve this approach. Many people identify their city by its natural character.

At the same time, considering the culture of the people is important. The sense of place is different to people who come from different cultures. The development may fit the place, but it is not certain that it will fit the culture of the people.

### **Visual characteristics**

"Each site has a special character creating a sense of place which is derived from natural and cultural qualities and places it properly within the whole landscape" [67].

Most of the E.N.T.s have been situated within desert areas which appear to be level, even if they are actually slightly sloped or gently rolling, with the exception of 1st of May new town's site. The lack of third dimension of a level landform creates an open spacious feeling. There is no definition of enclosed space (though the sky and horizon do act as implied spatial edges) and no sense of privacy. Relatively level sites in regions like plain desert, tend to appear quite open and expansive. Fig (3.111) shows the south east area of Sadat City where the land is almost level. Owing to the openness of level landforms, views may extend uninterrupted for considerable distances. One can often see a great distance (if other elements do not interfere) to the





Fig (3.111) Shows the south-east area of Sadat City where the land is almost level.

horizon or other enclosing points of the ground. This characteristic has emphasised the feeling of a spacious desert around the E.N.T. Unfortunately the design of all the E.N.T.s has ignored the impression of surrounding areas and their characteristics. Because these areas are off-site the design does not pay attention to them, so the new towns with their building and landscape, have been seen as individuals and small parts of the whole scenery which is dominated by the beige ground and bright sky. In general, the visual analysis indicates that the quality of the landscape is such that production of numerous skylines is limited: diversity and quantity do not exist.

The basic landform of a site is a visual and aesthetic resource which strongly influences the aesthetic resource which in turn strongly influences the location of various land uses and interpretive functions. The level landform can be exploited: it's potential of giving long views may help to establish a sense of unity within the new town, visually and functionally connecting other components in the landscape of the new town. These components may be easily seen and visually related to one another. Here the landscape element should be designed carefully to avoid repetition and monotony.

Landform also has a direct bearing upon the aesthetic character and rhythm of the landscape, and if there is any desirable view it should be borrowed. It is important to recognise the visually sensitive slopes facing any of the new towns. The south hills around the industrial areas in 10th of Ramadan (Fig (3.11) above) for example should be considered from the point of view of the visual impact of the development. It should be treated as a positive and integral part of the main concept, and may be planted with trees as a woodland area to provide protection for the industrial zone while, at the same time, reinforcing and enhancing the existing landscape structure. Fig (3.112) shows a

proposal by the author in the south hills area of 10th of Ramadan, for cultivating an area of native trees. In other areas of the E.N.T. where the view is always open to extended desert sand there is a lack of any distinct elevation variations (Fig (3.43) above). An intensive woodland area of different species will create a close green vista and produce a diversity and quantity of landscape to the scenery. A woodland of a cultivated desert plant community consisting of palm trees, olive trees and some other small orchard trees below will produce a skyline of different height, texture and colour (Fig (3.113)). In general, the ground plan itself must be altered and/or other design elements such as vegetation or vegetation and walls must be added to the site to alleviate problems associated with the lack of spatial definition.

A visually level site could also be modified to lend itself to both excavation and mounding which can be undertaken for the visual effect. There is no attempt at modification and stewardship of the earth's surface for any function within the E.N.T. sites. Many exterior spaces could be defined by a simple modification of the level landform. The modification could be used to control views or create closed vistas from the surrounding desert.

#### **Urban mass and landform**

The level landform has a great influence on the urban landscape scheme. The grid pattern dominates most of the E.N.T.s. The generally level, gently rolling landform may have led the designer to create hard, rigid, geometrical landscape characteristics almost neoclassical in style. Long straight axes and open vistas of green and water areas are however not easy to achieve in an arid climate. At the same time there are no remarkable views around the E.N.T. to be considered, which means there is no need to orientate the urban mass outward. Moreover, the recent urban form of most of the E.N.T.s resembles a solid block

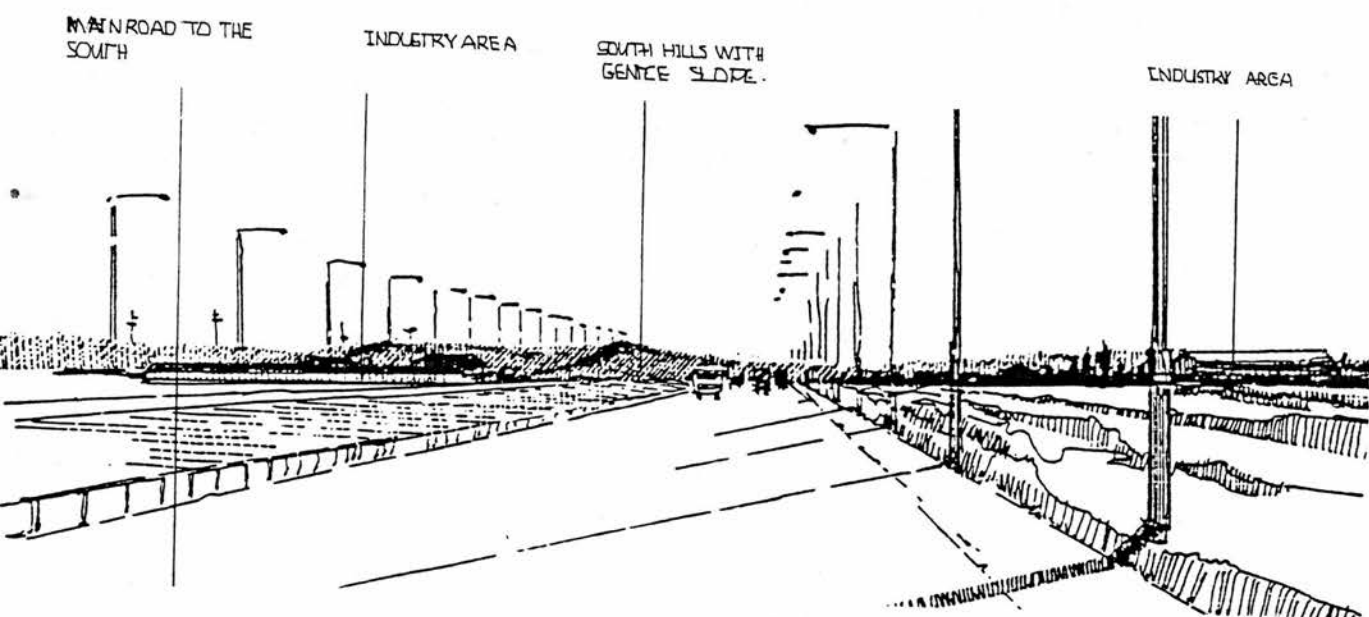


Fig (3.112) The southern hills area of 10th of Ramadan could be cultivated by native trees to create a close green vista to the city from the south and to protect the city from the dusty south wind (sketch by the author).

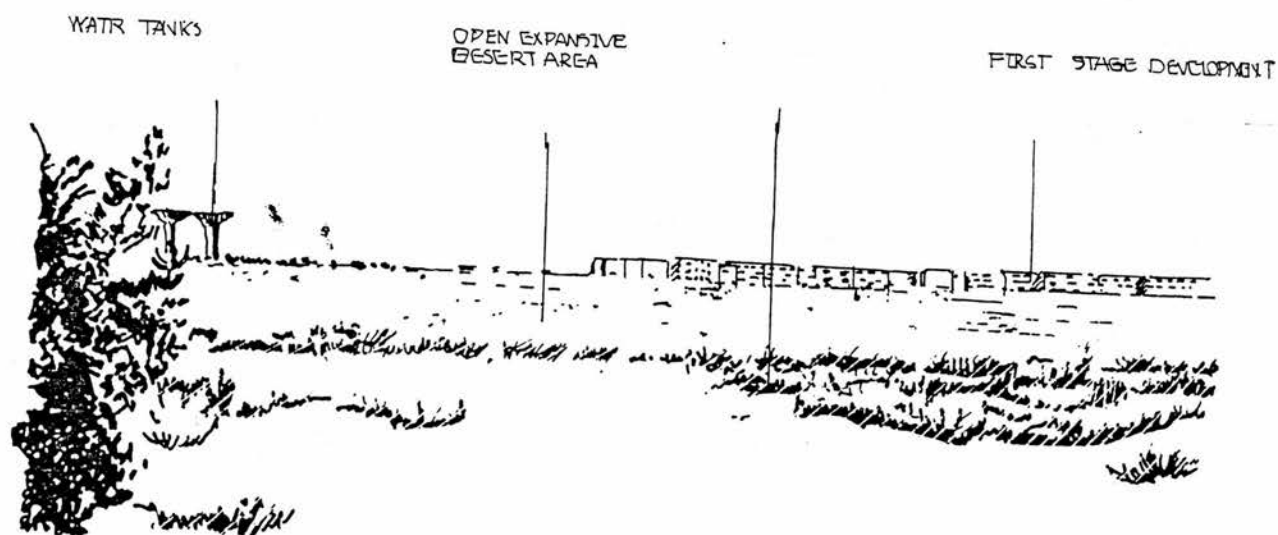


Fig (3.113) A woodland of cultivated desert plant communities consisting of palm trees, olive trees and some other small orchard trees which will produce a skyline of different height, texture and colour. The palm trees will provide the identity of the Egyptian landscape (sketch by the author).

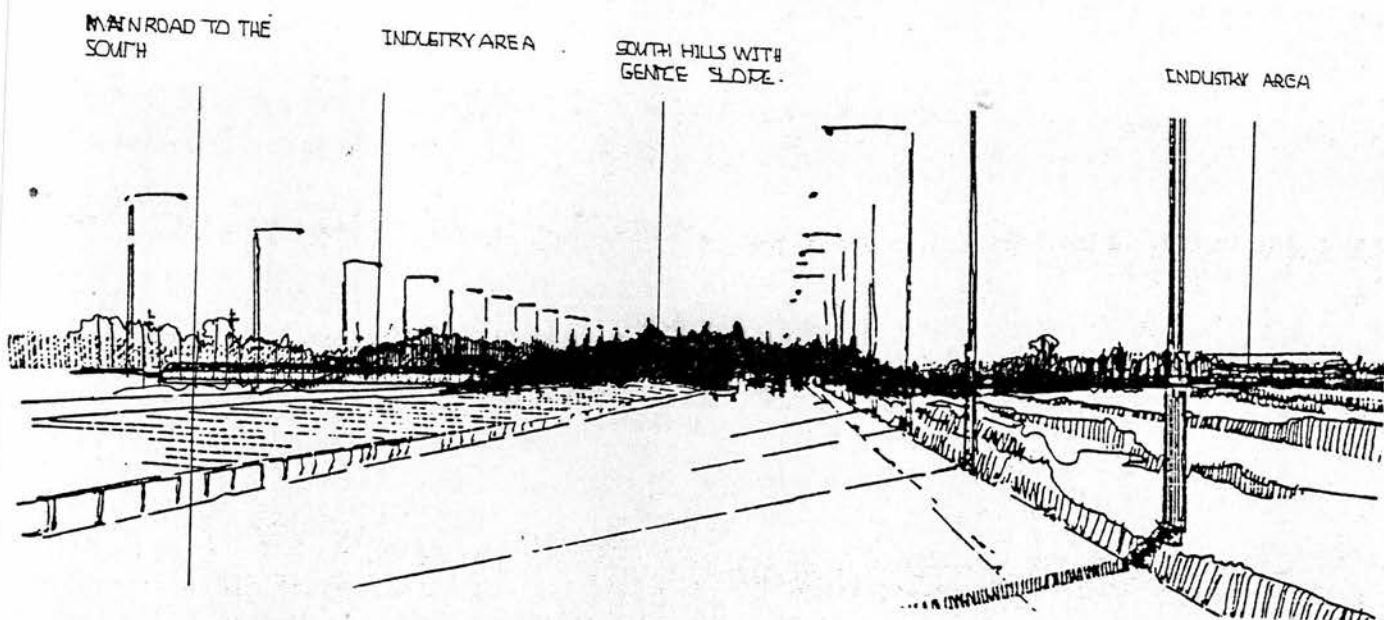


Fig (3.112) The southern hills area of 10th of Ramadan could be cultivated by native trees to create a close green vista to the city from the south and to protect the city from the dusty south wind (sketch by the author).

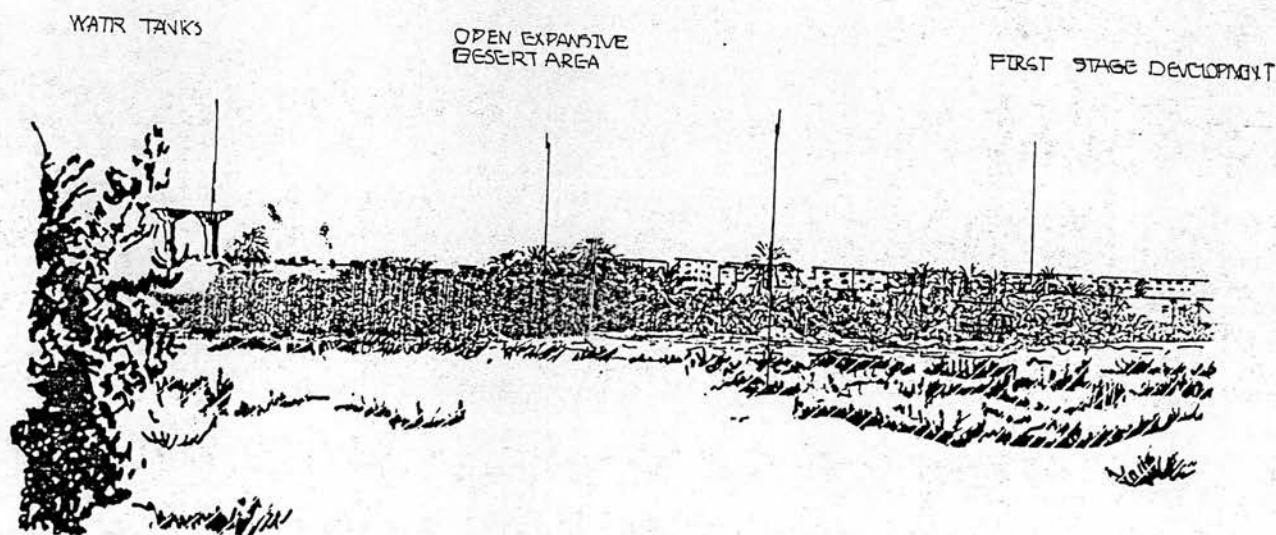


Fig (3.113) A woodland of cultivated desert plant communities consisting of palm trees, olive trees and some other small orchard trees which will produce a skyline of different height, texture and colour. The palm trees will provide the identity of the Egyptian landscape (sketch by the author).



separated from its surrounding site: there is no integration between the urban mass and the landform and as a result of the lack of a third dimension in the desert site, an unpleasant microclimate has been created.

Landscape design should be the art of building on, and with consideration for the earth's surface. In spite of the advantage of a level landform being able to accommodate any design, many landscape architects find it initially more difficult and challenging designing on a level landform than on one with distinct slopes and elevational changes, purely because the level site permits so many design alternatives [68].

In a desert site which has less than desirable features or views, a compact inward looking urban mass of lowrise buildings with horizontal lines may be an appropriate solution to new settlement in a desert plain. The horizontal lines and forms are harmonious elements which fit comfortably into the environmental setting [69]. The traditional compact mass of old desert cities appears to be an ideal form to fit the plain desert. The buildings integrate into their sites by extending in a number of directions and forming a protected space in between. These extensions of the form act visually like areas that reach out to hold onto encompassing parts of the site.

On the contrary, any vertical element which is introduced to a level landform has the potential of becoming a dominant element and focal point. The water tank has thus been used as a landmark element for most of the E.N.T.s. In some of these new towns it appears an acceptable element, but in others it has been overdone. In level land, it does not take much height to attract attention, so tall features and buildings may look out of place. Fig (3.114) shows one of these water tanks in 6th of October new city; the building appears as an isolated

tall block in disharmony with the surrounding spacious desert land.

In addition the lack of the third dimension of a level land form in the E.N.T. desert site has created open, spacious and exposed areas. There is no protection from open sight, and sands, no defence against sun and wind. There is no variation of the microclimate within the city itself, because there is no specific area which differs from the rest. This emphasises the importance of other design elements such as vegetation and buildings to contribute to the site, to alleviate the problems associated with the open plain desert. In some areas landform could also be used for the same purpose. It could be used to artificially create earth berms and block strong winds. Artificial berms can be used to provide wind protection in much the same way as hills and hedges, on a smaller scale. Well-designed landscaped berms can provide valuable open space and natural buffer zones in an ever-expanding urban jungle. Fig (3.115) shows an artificial berm protecting a housing area.

On a large-scale, berms can be organically sculptured to blend into the existing landscape as much as possible but will require planting to stabilise the soil and add visual coherence to the site [70].

In general, landscape architects should have the ability to manipulate and work sensitively with landform: every site has its own unique identifiable character, even the level one. Understanding overall site qualities can provide a positive contribution to the character of the design.



Fig (3.114) A water tank standing in the open desert - it looks isolated and out of place - and represents a loss of stability (photo by the author).

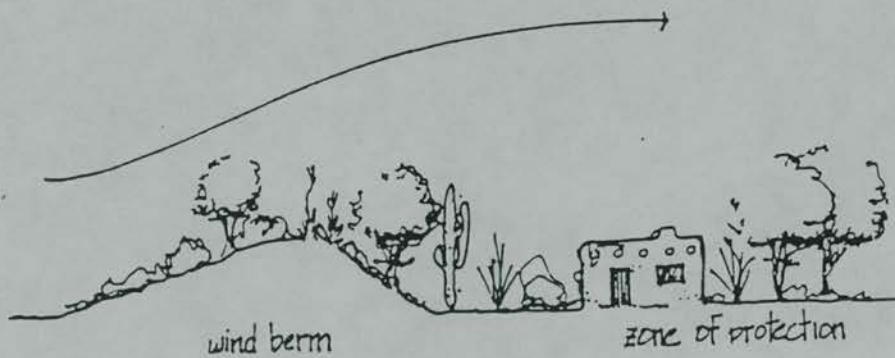


Fig (3.115) Architectural berms protecting a housing area. These berms should be covered with plants to stabilise the soil (Miller, 1978, p55).

### 3.4 Landscape process

The Landscape Process will be examined in this section (as the final stage) to complete the general view of the landscape design practice for the E.N.T. as it is shown in Diagram (3.1c). Although the task of examining the aspect of landscape process could be the subject of a thesis on its own, the research here seeks to shed at least some light on aspects involved in this section. The study will be concerned with the complete process from design to establishment and to management and maintenance. It draws upon new town landscape process experience in the UK, against the corresponding lack of experience in Egypt.

The main obstacle that was faced in this section was the lack of reliable data about the landscape process within the E.N.T. development corporation. "Any study of Arab countries has to contend with a lack of comparative time series data" [71]. Egypt is one of these countries. This lack of data has as far as possible been offset by site observation and interview with the E.N.T. authorities.

In order, therefore, to arrive at dependable conclusions, each factor of the landscape process will be examined with some reference to equivalent British experience for the same factor. This will be as follows: departmental structure, design process, establishment, management and maintenance.

#### **Departmental structure**

Unfortunately, a professional landscape designer was not part of the design team of either 10th of Ramadan or Sadat new towns [72]. In spite of the fact that the design teams (planners and architects) were mainly foreign professionals (SWECO, Stockholm for 10th of Ramadan city and David Cram Partnership and others, USA for Sadat City) and working in association with local professionals (S. Zeiton & Sabbain, Cairo), they did not involve professional landscape architects. This may have

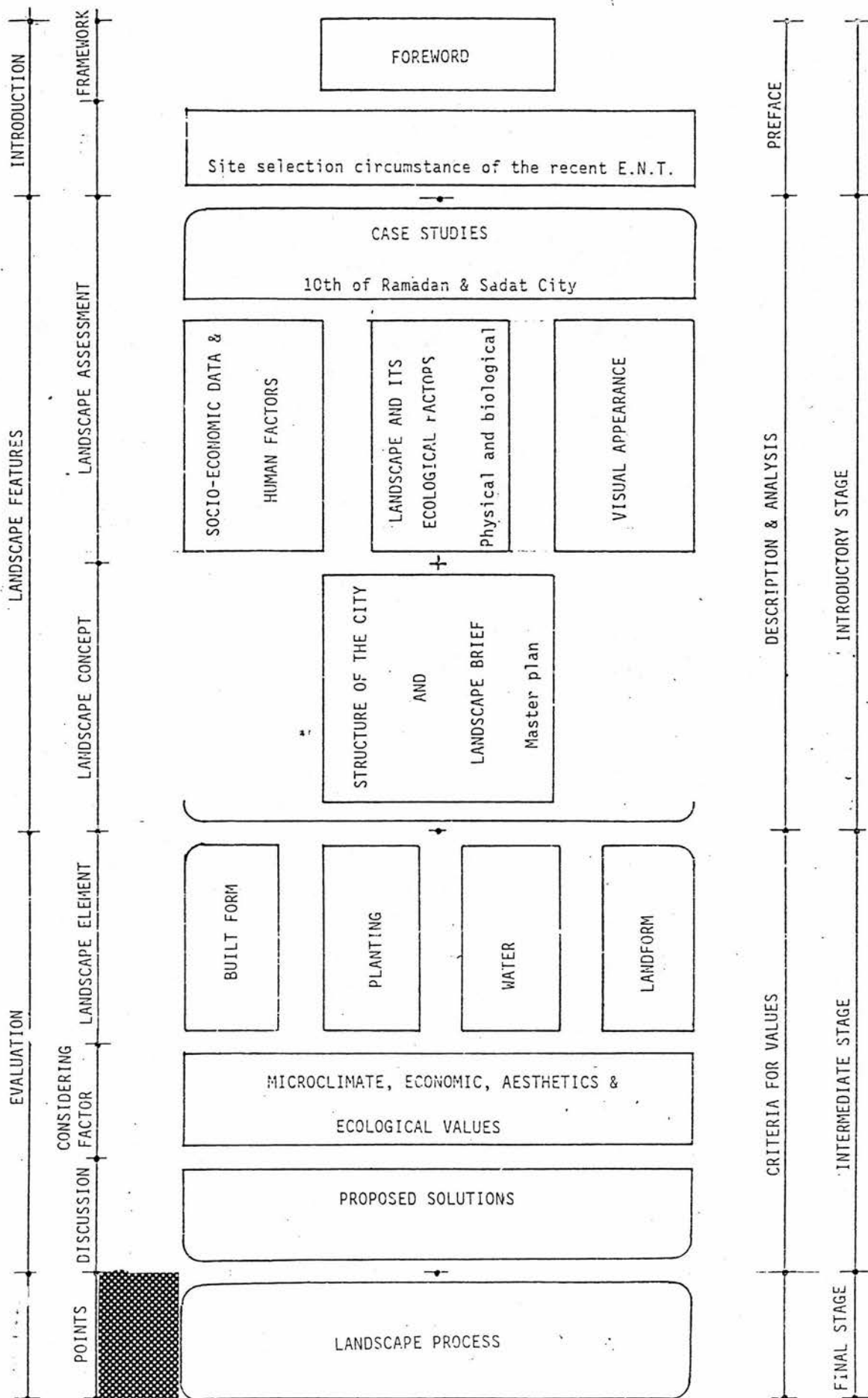


Diagram (3.1c) Shows the content and sequence of research in this section (Landscape Process).



caused a great part of the landscape problems of the E.N.T. Perhaps because a professional landscape designer was not part of the E.N.T. design team, a misguided western or European approach to landscape design has been adopted by the architects and planners.

At the same time, the landscape designer's professional role as it has become established in Europe and the USA does not exist in Egypt. Even in universities there is no complete education for landscape architects. There is only a tendency for the landscape designer to be thought of as a "plant arranger", and this term is misused as synonymous with landscape architect. The departmental structure of most E.N.T. development corporations does not have a special department for landscape architecture even in design departments or construction and development departments. There is only a department called the Agriculture Department which is responsible for supervision of plant construction work.

"Involvement of the landscape profession has been fundamental in the planning policies of (British) new towns and the landscape concern has been to maximise the potential of land use decisions and to reconcile the planning solution with the natural restraints" [73]. Most of the British experience proves that the landscape architect is always involved with the design team from the early stages, and certainly at the analysis stage. This early involvement by the landscape professional provides the opportunity for ensuring that landscape issues are carefully considered and provides a basis for a cohesive and coordinated landscape policy [74].

In most of the development corporations of the British new towns there is a department for landscape architecture. For example, in Cumbernauld Development Corporation, the Landscape Department works side

by side with the Architecture and Planning Departments. The landscape team consists of nine landscape architects, three professionals and two students and has in the past also employed landscape consultants to increase its capacity when needed.

The responsibilities for landscape activities in Cumbernauld new town are split between the following two departments: first, landscape architecture and forestry are the responsibility of the Principal Landscape Architect within the Architecture and Planning Department. Landscape work is carried out by direct labour and this is the responsibility of the Works Manager within the Financial Director's Department. Both departments, however, have close working relationships at all levels and on all functions. The table below (Table (3.9)) gives a broad indication of these.

An essential part of the landscape architect's professional activities are needed with the E.N.T. plan.

### **Design process**

The design process of most of the E.N.T. could be described in Saini's words: "It needs little imagination and minimum skill in a very short time to be designed. Literally thousands of such plans go out every day from municipal engineer's offices in all parts of the world" [75].

"With the democratic process of public participation and the need for government approval, a master plan for a U.K. new town takes about two years to produce; the actual building takes some twenty years and it can involve three to four hundred technical staff from the development corporations" [76]. The Cumbernauld D.C. for example consisted of 317, with a total of 378 manual staff at the time of the author's visit in 1987.

| ACTIVITY                               | RESPONSIBILITIES           |  | GENERAL NOTES  |
|--|----------------------------|--|--|
|  | PRIMARY                    | SECONDARY  |  |
| 1. Landscape & Forestry Policy         | Landscape Architects Dept. | *Direct Labour Dept.                                       | *In respect of feasibility and costing.                                |
| 2. <u>CAPITAL WORKS</u>                |                            |  |  |
| (a) Design                             | Landscape Architects Dept. | Direct Labour Dept.<br>Landscape Architects Dept.)         | Joint activities   |
| (b) Supervision of Work                | Landscape Architects Dept. |  |  |
| (c) Execution of Work                  | Direct Labour Dept.        |  |  |
| (d) Stock buying                       | Landscape Architects Dept. |  |  |
| (e) Growing on of stock                | Direct Labour Dept.        |  |  |
| (f) Supervision of Capital Maintenance | Landscape Architects Dept. |  |  |
| (g) Execution of Capital Maintenance   | Direct Labour Dept.        |  |  |
| 3. <u>MAINTENANCE</u>                  |                            |  |  |
| (a) Execution                          | Direct Labour Dept.        |  | All re-design work done in conjunction with Landscape Architects Dept. |
| (b) Scrutiny & Replacement of Losses   | Direct Labour Dept.        | *Landscape Architects Dept.<br>*Landscape Architects Dept. | *Watching brief<br>*Watching brief                                     |
| (c) Technical Policy                   | Direct Labour Dept.        | Landscape Architects Dept.                                 | Joint activity as in 2(d) and (e)                                      |
| 4. <u>NURSERY</u>                      |                            |  |  |

Table (3.9) Shows landscape functions and responsibilities for Cumberland Development Corporation (Cumberland Development Corporation, January, 1980).

In contrast, in Egypt the whole process for the master plan of the previous two cases studies took less than eighteen months. The consultants, largely trained in western methods of town planning, usually form a small committee set up by the government. In some cases, they are expected to produce detailed buildings so that building work can start before the master plan is completed and to satisfy a political decision.

The absence of the landscape architect in the E.N.T. design process and his lack of input at the master plan stage has a very bad influence on the landscape concept established. The detailed landscape design is often placed in the design of outdoor space almost as an afterthought in the completion of a project. There is no drawing for landscape detail for most of the site of the E.N.T. The only thing provided is some indication of the finishing material for the site (soft or hard landscape). Even where there is some detailed drawing, it does not fit the site. Needless to say, many of the assistants involved in the design work never see the site or have satisfactory acquaintance with the site features.

It is very common to delegate the detailed landscape design and construction to some contractor who is responsible for construction of a group of houses within the area which should be landscaped. The only thing is that this work should be done under the supervision of the onsite agricultural engineer for the E.N.T. authority. There is never a clear concept to be followed for the whole city. A project always goes through an adjudication process for a restricted specification book for all the sites. The project is always awarded to the lowest priced tender. In general, the design process for the landscape of the E.N.T. is far from what it should be.

J. Tomes (Director of the Landscape Department of C.D.C.) says "Our more successful landscape designs (Cumbernauld) are the result of good

teamwork involving the landscape architect, planner, architect and engineer from the earliest stage of the design process" [77]. The problem of landscape in the first stage of design should deal with the planning scale such as selection of the best site for the development and how to fit the urban mass to the existing landscape and the best land use for the area. The site scale will be the next stage.

A. Willens has recommended a design procedure for landscape projects in arid areas. He said:

"The starting point must be a full analysis of the site to determine its characteristics and limitations. Plant selection can then be carried out while engineering or architectural designs are being prepared.

The landscape architect is then in a position to prepare outline landscape designs. During their preparation he should work closely with the plant expert and the irrigation designer, both of whom should have visited the site during the analysis phase. Careful working out of landscape treatments in relation to plant water requirements, grouping of plants with similar water needs, total water requirements and salinity tolerances will save expensive amendments at later stages. It will particularly ensure that the final designs are practical and can be successfully implemented.

While the final designs are being prepared, irrigation criteria, system specifications and detail drawings can be prepared. However the landscape architect must remember that the irrigation designs themselves can only be drawn up after the landscape designs are completed. This means that the landscape architect must ensure that he leaves sufficient interval between design completion and submission for this



work to be carried out" [78].

In any design process, attention must be paid to maintenance requirements and the availability of funds for this purpose after completion. This will be discussed later in this section.

### **Establishment**

Reliable landscape contractors have an important role to play in the development of the landscape industry. The scope for landscape contracting in Egypt is limited. There are a few contractors, mainly dealing with planting construction. From the interview with E.N.T. authorities, it emerged that there are quite a number of contractors, but skilled ones are very rare.

The main problem that faces landscape contracting in Egypt is the lack of skilled labour. "One of the more likely explanations of the slow progress of the construction work (building or landscape) of the E.N.T. development appears to be the lack of skilled labour" [79]. Most construction workers working in the E.N.T. are not permanent workers for such work. The success of a landscape scheme depends not only on careful implementation but also on adequate maintenance. The E.N.T. expertise in this field is very limited and trained labour nonexistent. Training centres should be established in the new town areas, especially for horticultural workers.

Nurseries are one of the most important elements that ensure a successful new town landscape. Most of the recent public E.N.T. nurseries are small in size and all the work is done by hand. The irrigation system is usually based on surface methods. Old techniques of plant propagation in the Nile Valley are applied in the desert new towns. The capacity of these nurseries is low and their product inadequate to replace the damage being done onsite. Most of the plant material needed for the E.N.T. is imported from Nile Valley nurseries.

The 10th of Ramadan master plan recommended establishing a nursery to provide the new town's plant needs. An area of 30 hectares was regarded as large enough to supply the whole city (Fig (3.116)). It was recommended that the nursery should be located close to the water well outside the city in the north-western part. The estimated water quantities needed by the nursery per month was 152.225 c/m. Unfortunately, no site for this nursery has been found on the 10th of Ramadan site eight years after the start of the development except for a small area in the southern part (Fig (3.117)).

Establishing nurseries in the early stages of a development on the same site is a basic step to ensure a successful landscape for a new town. Most of the British new towns established appropriately-sized nurseries to satisfy the need for plant material. Also the green space of the nursery was looked on as a green area within the urban mass of the new town and could be considered as part of its total landscape area. In some instances it also provided a recreation area for the new town residents.

The D.D.C. nursery near Sadat City is a good example to be followed in most of the E.N.T. in desert areas. The nursery is run by the American University in Cairo and has been located in an area close to Sadat City; unfortunately, however, the authorities of Sadat City did not try once to look at what was going on in this nursery and still apply the conventional technique from the Nile Valley while the D.D.C. nursery applies the desert technique to the propagation and production of plants. Greenhouse units of 200 m<sup>2</sup> could provide 3000 seedlings every two months (Fig (3.118)). The irrigation and moisture is controlled manually or automatically. The seedlings are always transferred to another shaded area (Fig (3.119)) which acts as an intermediate zone between the greenhouse and the desert site. The nursery is run by one

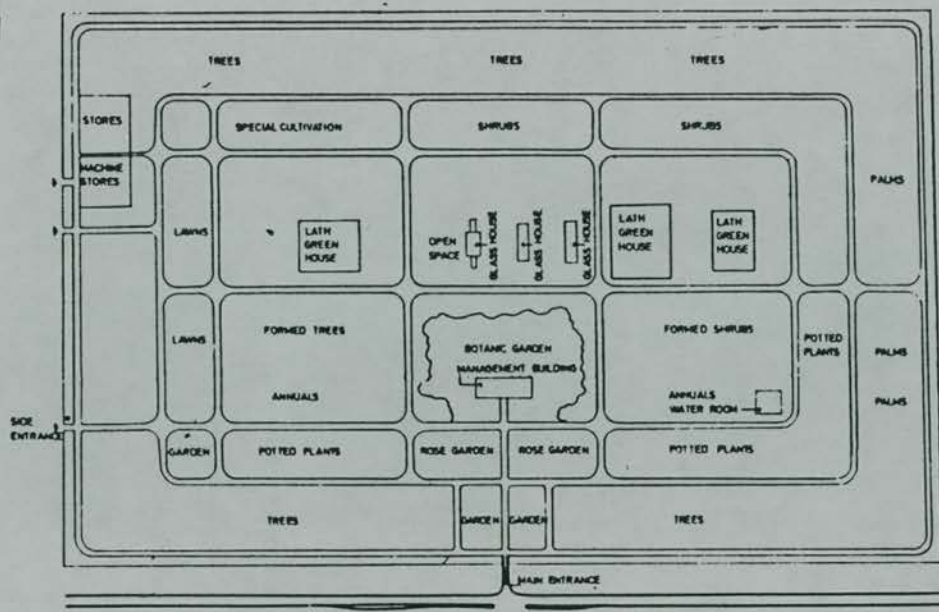


Fig (3.116) Plan of the proposed nursery area (10th of Ramadan) (SWECO, Master Plan, 1978, p8:10).



Fig (3.117) Shows the existing nursery area of 10th of Ramadan (photo by the author).





Fig (3.118) Shows the greenhouse for the D.D.C. Nursery in the desert area close to Sadat City. It is covered with polythene sheeting (photo by the author).



Fig (3.119) Shows an intermediate zone between the greenhouse and the desert site. It is covered by 'Lightscreen' (photo by the author).

technician and six labourers. Most of the plants which are produced there have been cultivated in desert soil without any treatment.

All plants are at their most vulnerable stage in the first year of growth. From the site observation of the E.N.T., the major factors that restrict plant growth are lack of water, high temperature and high wind speed. At the same time, grazing animals and children present a greater threat to plant establishment than all the climatic factors put together.

### **Management and maintenance**

The implementation of design from paper planning to layout on the ground is only the start of the design process. In fact, the management process determines its form over time.

Unfortunately, lack of management is the common feature of most administrative organisations of the E.N.T. The main cause of this situation may be a large bureaucratic system which leads to delays occurring from time to time in the administrative procedures, and poor coordination between different sectors. At the same time, the landscape design of the E.N.T. is not only a new experience for the Egyptian, but also a difficult project to be managed because of its size and complexity and the too rapid establishment of E.N.T.

One example of lack of management could be presented from 10th of Ramadan. "One kilometre of 12 m wide road costs about LE 150000. Unused roads represent a lavish waste of money. About 50 km of double road was established in the new city. If such roads were constructed as single roads as it was planned in 1977, until it becomes essential to construct double roads, it would be possible to construct instead, for example, 18 primary schools of 4200 sq m each" [80]. The Egyptian government's chronic shortage of money together with the high inflation rate may cause the ambitions of the E.N.T. plans to come to grief



especially with the recent level of management [81].

"The British new town corporations have understood well the need for landscape management and have built into their designs comprehensive visions on the long term future" [82]. Landscape maintenance concerns the routine care of land, vegetation and hard surfaces in the manner prescribed for their satisfactory establishment and continued future performance [83].

Lack of maintenance diminishes the landscape standard for the E.N.T. over time. Most of the plants die after the landscape contractor has handed over the planting area to the administrative authorities of the E.N.T.

The budget for maintenance is one of the main obstacles that cause the problem. It is in most of the E.N.T. year by year and there is no clear plan for an upkeeping budget in the long-term (ie five year plan). The budget for maintenance may be reduced as has happened in 10th of Ramadan new city plan for the years 1985-90 or it may be transferred to another section of the development. It seems that the E.N.T. authorities are looking at maintenance provision as being desirable, but not essential. This leads to incomplete roadways and pathways, planting (Fig (3.88) above) is lacking and even other basic amenities remain unprovided.

The lack of skilled labour for maintenance is the second obstacle that causes the problem. The maintenance work for the E.N.T. is likely to be carried out by illiterate labourers with little commitment to or knowledge about the work they are being paid to do.

Maintenance can be defined as day to day horticultural care based on a management plan. It is clear that most British new towns have built up maintenance teams which have become, in a comparatively short space of time, skilled in this particular work [84].

Providing landscape contractors who will accept responsibility for long term maintenance will solve the problem of unclear responsibility for landscape at the time when the contractor hands over the project to the authorities. The Welwyn Garden City experience is a good example to be followed to counteract the lack of management in the landscape areas of the E.N.T.

The responsibility for the landscape of Welwyn Garden City had been taken by Digswell Nursery Company which was formed in 1921 (as part of the Welwyn Garden City Company) with the laying of the development. With the New Towns Act (1948), the Development Corporation was formed and took over the Company and the task of completing this town. It was quickly seen how great was the advantage to be derived from utilising the services of an existing organisation, backed by local experience and intimate knowledge of the existing layout and landscape features [85].

It will also be necessary to identify maintenance which should be done by the district council and that which should be done by the people by encouraging residents to initiate and maintain planting in areas under their control. Considering that maintenance should be started from the earliest stage of the design process, it is never too early for designers to think about the management and maintenance implications of their design.

This aspect has been completely ignored in the E.N.T. Neither the landscape concept applied nor the plant material selected have been considered with respect to their maintenance problems. Suffice it to say that the more the landscape area of the E.N.T. is broken into little pieces, be it by flowerbeds or grass beds, the more expensive it will be to look after. Plants are selected which require a high maintenance budget and intensive labour.

A more acceptable approach is to use native plants in ecological

groupings which require little upkeep. "The present ecological bias of landscape design has been put into practice over the last twenty years within the rapid growth of the British new towns" [86]. Most of the British new town corporations have understood well the need for landscape management and have built into their designs comprehensive visions of the long term future.

A U.K. research study was made to forecast the maintenance implications and cost of a particular open space of housing design at design stage. The study was applied to a range of different housing design solutions on an actual development project, Park 3 West at Cumbernauld New Town (Fig (3.120)). "The Cumbernauld maintenance officer accepted the conclusions of applying the method to the three test schemes and admitted a preference for the economies of B and C over those of A" [87]. To reduce maintenance cost by considering it in design is an important task. The management of a place is as important as its initial form. In any case, any landscape plan must include a plan for maintenance, a budget, a set of priorities, a calendar of routine upkeep, and an allowance for that intensive care and partial replacement which must always follow the establishment of a new planting [88].

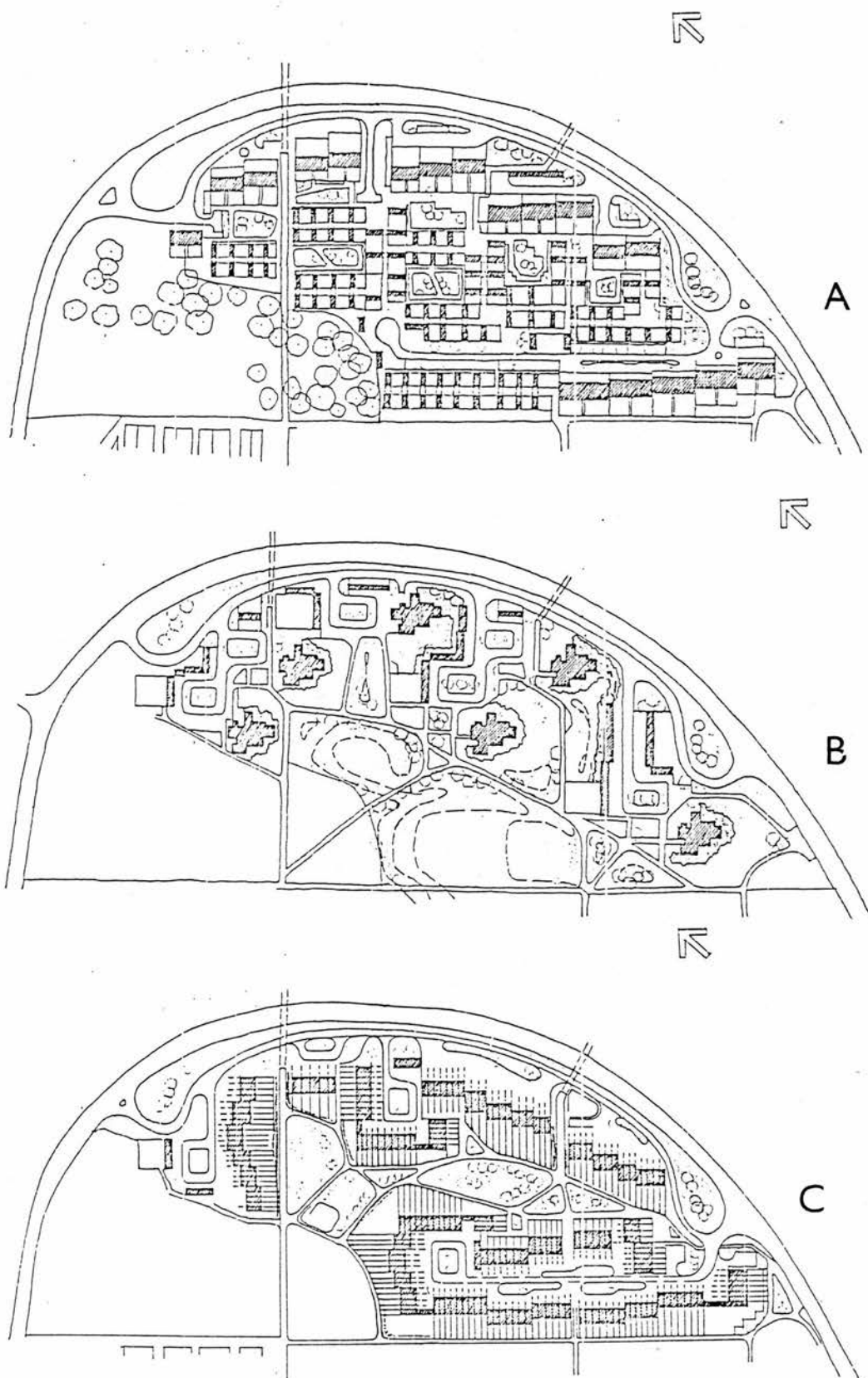


Fig (3.120) Shows the different housing design solutions, Cumbernauld New Town. Three different design solutions to the same housing brief each one assessed and costed for management and maintenance of public open space. (Byrom, Studies of local open space in British housing, 1976, p310,a,b,c).

## Notes and references:

- [1] Golany, G., "Arid zone settlement site selection the case of Egypt", Ekistics 291, Nov/Dec 1981, p456.
- [2] Golany, G., "Urban planning for arid zones", 1978, p16.
- [3] Khodarie, A., "New Town location in Greater Cairo Region: Towards the determination of factors affecting site selection of new towns", Ph.D., Liverpool University, 1986, p2.
- [4] Ibid, p2.
- [5] Cairo University, "Protection of 15th of May New City from flood", 1982, Cairo, p62, Arabic.
- [6] A.O.D.C., "Extension of 15th of May New City-Helwan", Cairo, 1980, p20, Arabic.
- [7] Al Ahram, "New community, seminar", Al Ahram Newspaper, 14.11.86, p11.
- [8] SWECO, "Tenth of Ramadan" Master Plan 1976, Cairo, V1-V4.  
SWECO, "Tenth of Ramadan" Master Plan 1978, Cairo, V1-V2.  
SWECO, "Tenth of Ramadan" Growth Plan 1982, Cairo.  
Sabour, Ass, "The Planning of Sadat City", Final Report, Cairo, 1980, V1,2,3.
- [9] Saïd, "Geology of Egypt", p216-221.
- [10] Hyland, A., "Housing in Egypt", 1986, p86.
- [11] Walter, H., "Ecology of tropical and sub-tropical vegetation", 1976, p444.
- [12] D.D.C., "Desert Development Centre Report", American University, Cairo, 1985, p1.
- [13] Booth, W., "Basic elements of landscape architecture design", Elsevier P.C., New York, 1983, p127.
- [14] Saini, B., "Building environment", Sydney, 1973, p84.



- [15] Hough, M., "City form and natural process", Sydney, 1984, p12.
- [16] Clouston, B., "The role of the landscape architect", "Landscape design for the Middle East", Ali, T. (ed.) et al., London, 1978, p14.
- [17] Abdin, A., "A bio-climatic approach to house design for semi-desert and hot climates with special reference to Egypt", Liverpool Uni., Ph.D., 1982, p316.
- [18] Fa'hy, H., "Vernacular architecture: principles and examples with reference to hot arid climates", Chicago, 1986, p34.
- [19] Newton, P., "Planning new towns for harsh arid environments: an evaluation of Shy Gap and Newman mining towns, Australia", Ekistics 11, March/April, 1985, p181.
- [20] El Bage, A., "Enhance the cultural value in the contemporary Islamic city", Arabic, Cairo, 1982, p71.
- [21] Hough, op.cit, p47.
- [22] Attia, Y., "A new settlement policy for Egypt", Uni. of Liverpool, Ph.D., 1984, p .
- [23] Hyland, A., op.cit, p84.
- [24] Khodarie, A., op.cit, p165.
- [25] Sameh, H., "Planning and architectural criteria with respect of climatic conditions", Cairo Univ., 1987, p54, Arabic.
- [26] Golany, G., "Design for arid regions", New York, 1983, p20.
- [27] Hough, op.cit, p49.
- [28] Booth, N., op.cit, p66.
- [29] Cook, J., "Landscaping for microclimatic advantage in arid-zone housing", Golany, G., "Housing in arid lands", London, 1980, p230-232.
- [30] Desert Development Centre, D.D.C. Report 1985, American Uni., Cairo, 1985, p27.

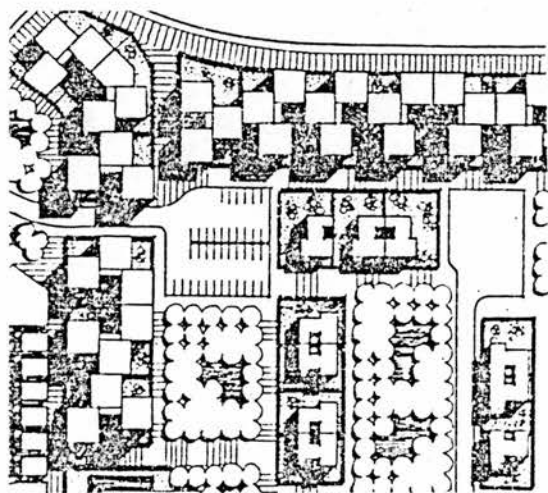
- [31] Hyland, op.cit, p94.
- [32] Hough, op.cit, p135.
- [33] Ibid, p245.
- [34] Khodany, op.cit, p1.
- [35] Saini, op.cit, p83.
- [36] Ayyad, M., "Hot Desert of Egypt and Sudan", "Hot Desert and Arid Shrublan", (ed.) Evenari, Amsterdam, 1986, p194.
- [37] Sabour, 1980, p(7.3.9).
- [38] Adams, R., et al., "Dry lands: man and plants", London, 1978, p58.
- [39] Hoyle, D., et al., "The use of native plants in urban area", "Landscape design with plants", London, 1977, p99.
- [40] Turner, T., "The design of open space", "Landscape design of the Middle East", Cochrane, London, 1978, p31.
- [41] Hoyle, op.cit, p99.
- [42] Walter, H., "Ecology of tropical and subtropical vegetation", 1978, p76.
- [43] Hoyle, op.cit, p122.
- [44] Golany, G. (ed.) "Urban planning for arid zones", 1970, p200.
- [45] Hough, op.cit, p113.
- [46] Ibid, p244.
- [47] Ibid, p119.
- [48] Faratat, A., "Urban food-production for a self-reliant desert community in the Middle East", Canada, 1981.
- [49] Ought, op.cit, p113.
- [50] Ibid, p229.
- [51] Miller, J., "Design and the desert environment: Landscape architecture and the American Southwest", University of Arizona, 1978, p53.
- [52] Cochrane, op.cit, p48.

- [53] Kelly, K., "Landscaping the Saudi Arabian desert", Philadelphia, 1976, p46.
- [54] Greene, G., "Landscape and cityscape design in arid regions", op.cit, Golany, 1978, p200.
- [55] SWECO, op.cit, V4, p3-2.
- [56] Kelly, op.cit, p49.
- [57] Haugth, op.cit, p71.
- [58] Sabbour, op.cit, p5.38.
- [59] Greene, op.cit, p200.
- [60] Saini, op.cit, p254.
- [61] Hyland, op.cit, p53.
- [62] M.H.R., "Suez Canal Regional plant", Cairo, 1976, p24.
- [63] Adams, op.cit, p261.
- [64] Saini, op.cit, p261.
- [65] Turner, op.cit, p33.
- [66] Booth, op.cit, p2.
- [67] Unterman, R., "Site planning for cluster housing", New York, 1977, p32.
- [68] Ibid, p33.
- [69] Ibid, p35.
- [70] Miller, op.cit, p43.
- [71] Misra, R., "Urbanization and national development: the quest for appropriate human settlement policies in the Arab world", Ekistics 300, May/June, 1983, p210.
- [72] SWECO, op.cit, 1976, study team, vo, pXI & Sabbar, op.cit, study team, p8.28.
- [73] Winter, R., "New towns: a landscape of opportunity", "Landscape design", 1982, August 14.

- [74] Tones, J., "Cumbernauld New Town landscape", Cumbernauld Development Corporation, 1986, pII.
- [75] Saini, op.cit, p87.
- [76] Samworth, J., "Desert new towns", Landscape design, November, 1980, p37.
- [77] Tones, op.cit, pV.
- [78] Willen, A., "Irrigation techniques", op.cit, Ali, p60-61.
- [79] Swico, 1982, op.cit.
- [80] Attia, op.cit, p247.
- [81] Tule, J., "Suez City and region", Gartent & Landschaft, 11/79, p846.
- [82] Winter, op.cit, p8.
- [83] Cobham, R., "Landscape management and the fourth design dimension", "Landscape design with plants", ed. Clouston, B., p301.
- [84] Ibid, p8.
- [85] The Welwyn Garden City & Hatfield Development Corporations, "A report on landscaping", 1982, p5.
- [86] Winter, op.cit, p8.
- [87] Byrom, J., "Studies of local open spaces in British housing", Ph.D., Edinburgh University, 1976, p365.
- [88] Lynch, K. (Site planning), second printing, 1984, p(183-184).

PART III

SITE SCALE





### PART III

#### Landscape design of residential areas

Solving of the housing problem is one of the main goals of the E.N.T. policy. There is a great need for developing satisfactory housing environments. The proposed study in this part of the research will therefore concentrate on open space allocated to housing, as a step to improve the residential environment in new desert communities.

From the previous part (II), it is clear that the dominant concept of the E.N.T. was based on setting the dwelling in a large open landscape as in the cluster development of European new towns. This concept is completely different from the traditional Egyptian one where the garden is held within the form of the house itself. There is no evidence that the recent E.N.T. open space concept is an understanding and logical response to the traditional Egyptian one.

If we design a place for "residential use", then we must start by analysing residential needs and understanding their underlying social and ecological implications. This part is therefore divided into two chapters. The first examines the concept of Harah (the equivalent of the concept of neighbourhood in traditional Egyptian cities) against the recent concept of neighbourhood for the E.N.T. to see what best accommodates Egyptian needs. This chapter identifies the principles which constitute the basic structure of the Egyptian community. The second chapter closely examines a selected typical residential area in the E.N.T. including the residential use of open space. The problems will be identified and then judged against the findings of the previous chapter and conclusions drawn for future practice. These are then theoretically tested.

## Chapter 4: A comparative conceptual view for open space patterns in the traditional and contemporary environment: Egypt

The research concern here is not to examine the physical planning and design of the traditional city (where the traditional massive building in hot arid zones, for instance, had long ago achieved less waste while creating suitable standards of environmental comfort; the concept of compact town planning; the courtyard plans of building; construction with thick insulating walls; or the natural channeling of cooling breezes through the use of shadow and water). All of these have been thoroughly examined in the literature of the traditional urban environment.

In planning, however, some problems are larger than a mere matter of physical planning and design. Social factors, for example, should not be overlooked nor separated from the environment and its planning and design [2]. In fact, "the traditional patterns are as much an outgrowth of ecological adaptation to the environment as they are a reflection of cultural attitudes to place making" [3].

### 4.1 Concept of traditional neighbourhood (Harah)

The term "neighbourhood" does not exist in the vocabulary of the traditional Egyptian cities. It has been used only recently to refer to fabric of Egyptian urban settlements. In most of the traditional Egyptian cities the equivalent element to the neighbourhood is known by the term "Harah". This refers to a group of houses occupying an area around a single street (Harah) and is usually formed by relatively small homogenous groups. Fig (4.1) shows the typical plan of the Harah. "The Harah is today still regarded by the people who live in it as their own semiprivate domain and as the community that relates them to one another [4].

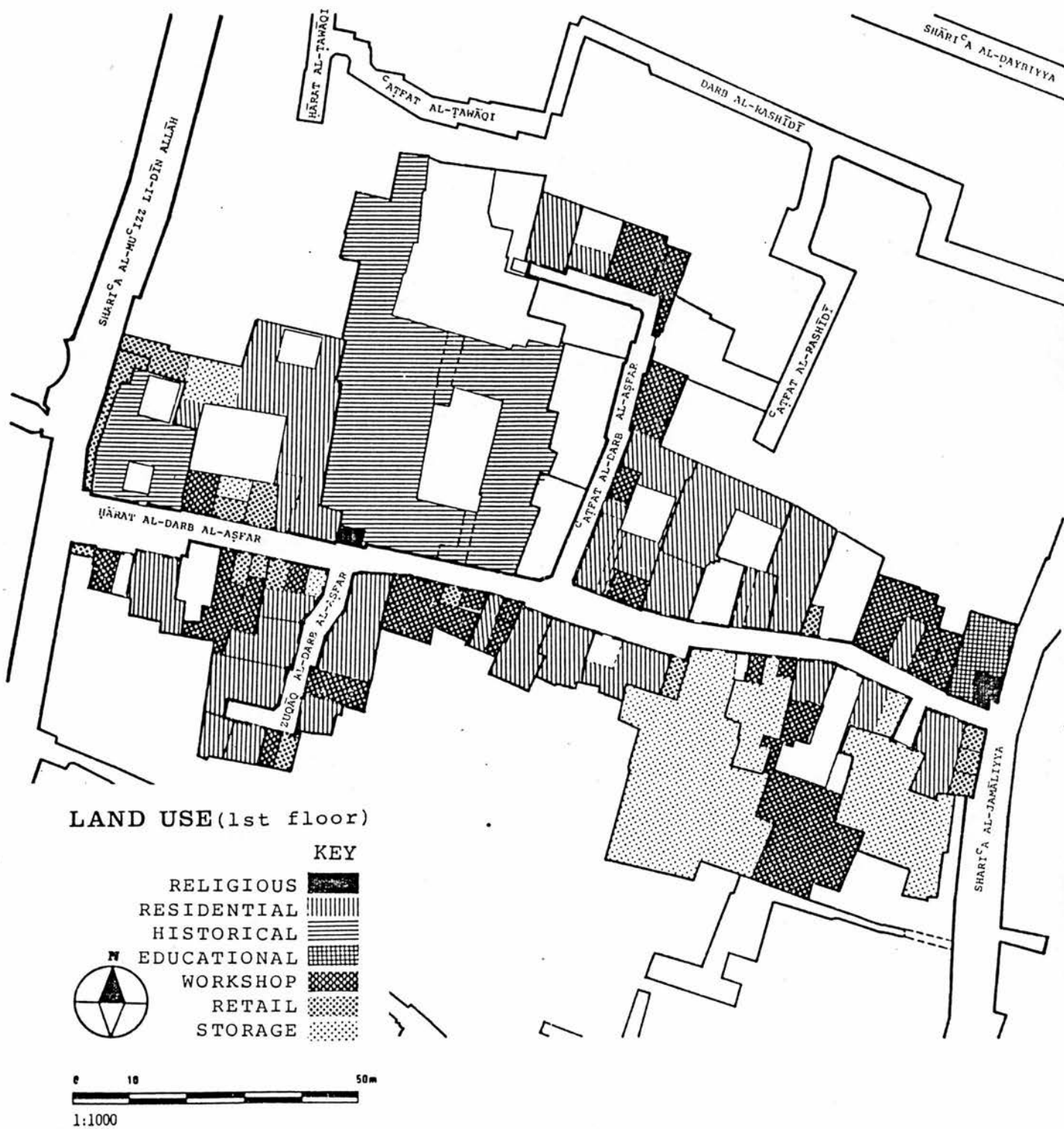


Fig (4.1) A plan of a typical Harah (M. Sioufi "A Fatimid Harah: Its Physical, Social & Economic Structure", The Aga Khan Program for Islamic Architecture, Univ. of Harvard, 1980, p20-21).

Accordingly, the examination will be through the old city of Cairo as a typical example of traditional urban form. As Ronald Lewcock puts it "one of the most remarkable things about the Islamic world is that there are still many urban societies functioning essentially as they were twelve hundred years ago . . . the old city of Cairo is one of these" [5]. The old city of Cairo has inherited all the major characteristics of a traditional Muslim Arab town. Its form reflects the needs of the Muslim family and its relationship with society.

In the Islamic city, the ascendancy of the state was underpinned by the role of the community groups and associations which formed the basis of the traditional structure of society. These associations were extremely diverse and offered the population a full range of participation in their activities. Some were formal, like guilds, others informal, like groupings of relatives, friends and neighbours [6]. The spatial organisation of the Islamic city reflects social and institutional structures based on well-defined groups sharing a common interest in a specific geographical area like Shiakha (quarter), Harah (neighbourhood), Atfa (group of houses) or Sinq (centre).

"There is no evidence, however, that homogeneity of social classes was a basis of solidarity. Economic, religious and social lives were not so differentiated from each other as to create the base for any radical separation of classes by quarter. Quarters were communities of both rich and poor" [7].

Fig (4.2) shows a large scale plan of the old city of Cairo, where it can be seen that the social pattern is physically visible, in the location of the various quarters (Shiakhas) and of the main public buildings such as the mosques, suqs and houses. The areas are related to one another and to the suq (the major roads). Each area has been named after the group or guild who used to occupy it.





The most important characteristic of the traditional old city of Cairo (like many other traditional Islamic cities) is the circulation system or the pattern of public ways. Actually, most of the public ways within the city were developed after the residential cells were allocated. This is in marked contrast to western cities for example built under Roman law where the city design began with roads [8].

The only exceptions in old Cairo are the major streets (Qasaba). These were actually planned and provided for as in most Islamic cities. They were part of the long-distance routes that connected cities with one another. They ran in relatively uninterrupted fashion between city gates and continued out to the countryside. One or more of these main arteries served as the linear "centre" (public open space) for manufacturing, commerce and vending. Also, along this main artery or at least in easy connection with it, were the main congregational madrasa (school) mosques and certainly many of the public buildings for government and for market administration. Fig (4.3) shows the oldest part of old Cairo (Fateme) 900-1000 AD with its two major roads. Fig (4.4) shows one of the main roads of old Cairo near the main gate (Bab Zuwayla).

#### --- Harah (main street)

On a small scale, the Harah or Traditional Neighbourhood could be seen as a group of houses or cells clustered around a main street (Harah) (Fig (4.1) above). The main street alleyway leads into a network of a series of open space hierarchy. The first element in this series is the Harah (main street) itself. This type of space (Harah) could be considered as a semi-public space serving for circulation; only at a point of general access did some limited commercial and service functions grow up to provide for the needs of the highly localised cellular community. These supported the ordinary needs of

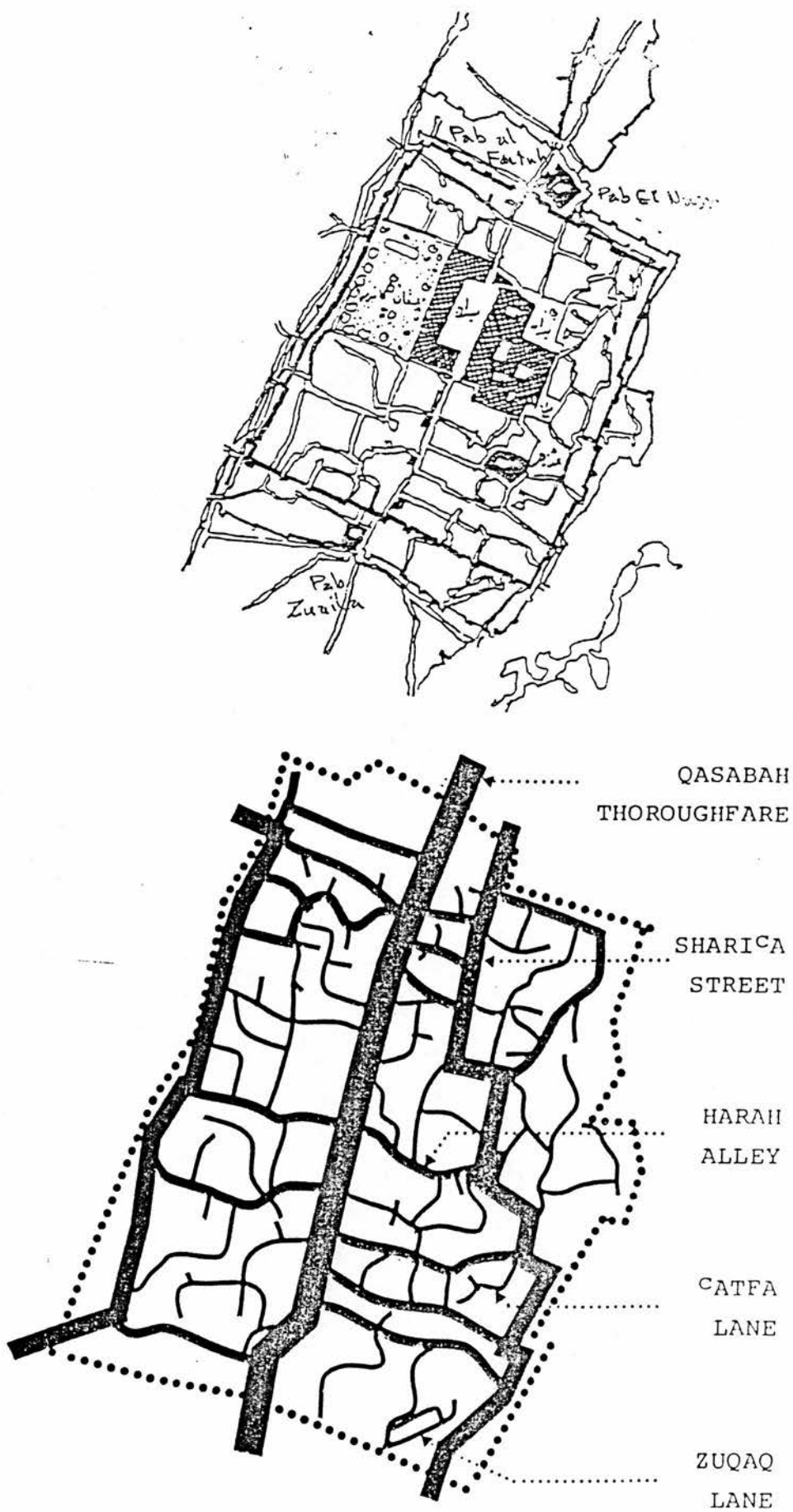


Fig (4.3) The plan of the old Cairo (Famteme 969-1171) and main road and pathways ((a) A. Ibrahim, 1982, p20; (b) M. Sioufi, 1981, p10).

every-day life. Also, smaller mosques (Zawayah) could be found in the main street (Harah). The Zawayah (singular of Zawayah) played a very important role in bringing together the heads of the families in the immediate proximity, while the larger one is used for the bigger community congregational prayers (Jumu'ah). Often the position of Imam (leader) in Zawayah is granted to the oldest, most venerated religious and respected head of the family nearest to it.

These Harat (plural of Harah) (alleys) were all left wide enough to accommodate two loaded camels walking side by side [9]. Each Harah provides access to a group of dwellings through its branches (Atfa or Ziquq) at one end. At the other end, the Harah always opens onto a main street or square (Maydan). Maydan is an urban element which had commercial activities. It usually hosted shops and trades of every description. Fig (4.5) shows a typical Maydan of old Aleppo. The Jumu'ah mosque (main mosque) is always found in the Maydan area. The Maydan area is also considered the main area for common activities and gatherings, especially in the evenings when the shops are closed.

### --- Darb (pathways)

The Harah has alleyways branching to small pathways. These pathways make up the second element in the open space hierarchy. They are clearly distinguished and referred to variously as "Darb, Ziquiq or Atfa", and in design they are intentionally short and dead-end. Fig 4.6) shows Darb Quirmiz with close end (old Cairo). The opinion which maintains that public pathways in the traditional Islamic city were developed after the residential cells had been allocated can be easily justified if we look at Fig (4.1) above. The passage between the cells served chiefly as the boundaries of contiguous cells; they occupied the land that was residual, left over from the growing together of the surrounding cells. In these passages the space is used as a common



Fig (4.4) The main road of old Cairo near bab Zawayla (lithography by J. C. Burne from Robert Hay "Illustrations of Cairo", London, 1940 (ed. A. Hyland, Housing in Egypt, 1986, p21).

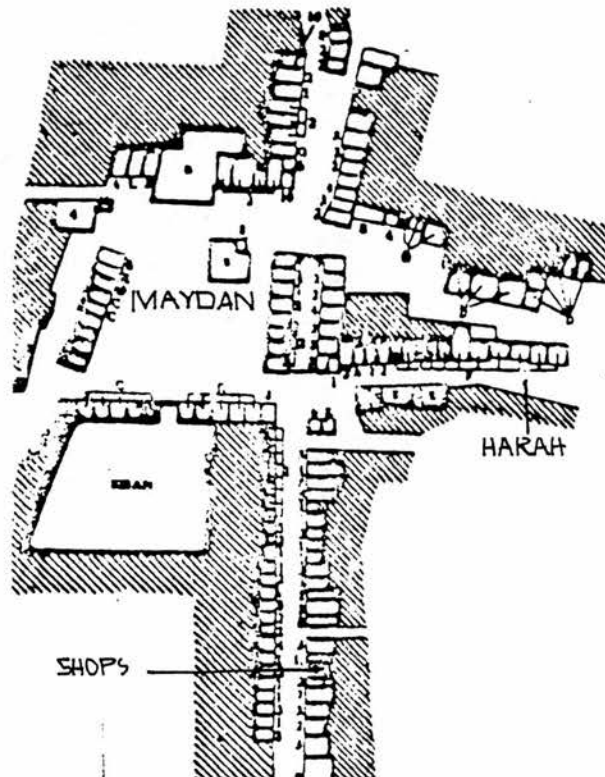


Fig (4.5) Shows a typical Maydan of old Aleppo traditional city (Ismailia "Arab Urbanization", Univ. of Karlsruhe, 1969, P140).

ground. This kind of space should perhaps not be considered parts of streets so much as interior paths within cells and serving only to allow access to the individual dwelling within the larger residential block. This space may then be considered as semi-private space used for circulation only. It is an attempt to create a protected area outside the dwelling unit itself (courtyard house) within which kin-like responsibilities (and freedoms) govern [10].

### --- Houch (Courtyard)

The last element in the series of open space hierarchy in the traditional neighbourhood is the courtyard. It is the most important place. The plan of the courtyard is basically square or rectangular. Most of the house elements are orientated inwards to the courtyard. Almost all openings would derive light and ventilation from the courtyard, but if the architect has to open windows through the outside wall, they would be above eye-level or covered by the beautiful Islamic screens known as "mashrabia" allowing light and ventilation while providing privacy.

The Islamic demand of privacy for the family has been strongly observed in the courtyard house. It reflects the Islamic family life as being inward looking or introvert. This is reflected in the building as the architect typically gives more attention and emphasis to the interior facades than to the exterior. Fig (4.7) shows a typical courtyard in a traditional house.

The rights and obligations of the family to live enclosed in its house had led to a clear separation between public and private life, which is, perhaps, the most significant social characteristic of Islamic culture and is derived from Sharia (Islamic law). Muslims believe that Islam is a comprehensive way of life and that the Sharia (Islamic law which is based on the Quran and Sunna) presents all the basics which





Fig (4.6) Darb Qurmez, a typical cul-de-sac pathway in a traditional old city of Cairo (M. Meincke (ed.), "Islamic Cairo, Architectural Conservation & Urban Development of the Historic Centre", 1980, p45.

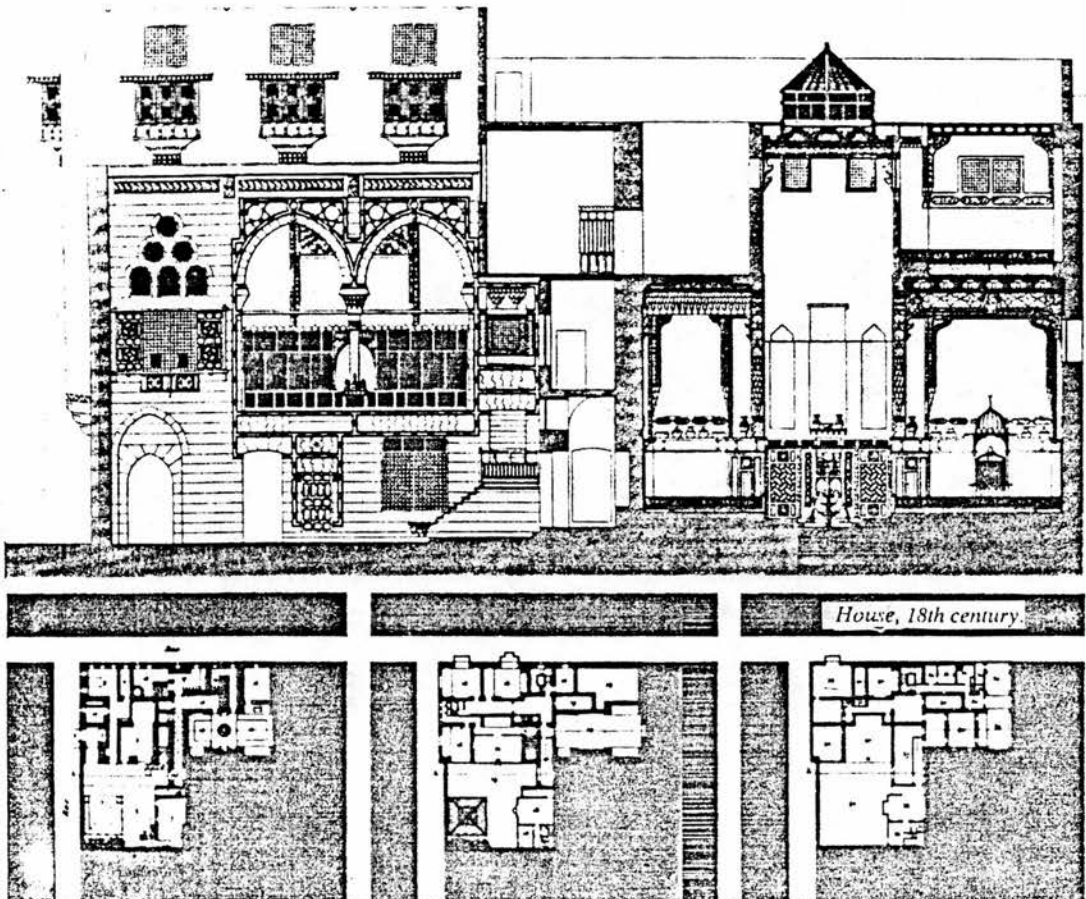


Fig (4.7) Courtyard in traditional house. It is clear that the architect gives more emphasis to the treatment of the interior facades than the exterior (O. Brabr, The Aga Khan, 1984, p15).

define guidelines for man in this life. It not only regulates the relationship between man and his creator, but also the relationship between man and man, and that between types of societies [11].

The interior courtyard performs an important function as a modifier for climate and privacy. It is used for eating, sleeping, recreation and domestic tasks. The courtyard provides a safe playground for the children, under the direct supervision of the mother, and provides a convenient space for living activities for adults in the open air. The courtyard of a wealthy, traditional house may also contain interior gardens with fountains or pools. Even in a poor family house one can often find some trees and plants.

#### **4.2 The concept of recent E.N.T. neighbourhoods**

In general, the average density on neighbourhood level has been set to average 150 persons/ha for most of the E.N.T. This figure has been based on western standards for neighbourhood units. The Egyptian "western" neighbourhood is built in a central area including the main services (schools, shopping, nursery) serving some 4000-7000 persons within a walking radius of 500 meters or 20 minutes walk. The design in such areas includes complete separation of cars from pedestrians, green edge, pedestrian areas, residential area layout and cul-de-sacs as residential streets.

In Sadat City the neighbourhood centre (primary school, telephone office, playing field, mosque and food shops) was planned to serve 4000 to 6000 persons within a walking radius of 500 meters [12]. A possible average size of the 10th of Ramadan's neighbourhood, based on elementary school population size, would be around 4000 to 5000 inhabitants. The school and the centre are located in the centre of the neighbourhood within 500 metres from the furthest point [13]. Fig (3.20) above shows a typical layout of a neighbourhood in 10th of Ramadan.

#### **4.3 Comparative analysis between the two concepts**

Spatial awareness derives from an individual's purpose, knowledge and familiarity with local circumstance, and from the interaction between the individual and the spaces in which his life is played out [14]. The traditional concept of Harah reflects the actual needs of its users. It is a result of the interaction between individual, society and the surrounding Islamic environment, which is completely different from the western environment. Industrial nations may well be ahead of the Muslim world in terms of material development. They may have established clear standards based upon formulated values in almost all aspects of human activity, including that of urban development. These values and standards not unexpectedly are reflected in newly planned settlements and are in some cases suitable for the environment of their western users. However, they have limited use and application for other people with different standards and cultural values. In fact, there is a fundamental difference between the new settlements in Egypt based on the western concept of neighbourhood and the traditional style of settlement based on the Harah concept. What follows are the main differences between the concept of neighbourhood and that of "Harah".

First: the fundamental characteristic of the concept of Harah is that it has emerged as a result of the major role played by the community groups and associations in shaping the urban environment. This system gives a great participation to the user to create their traditional dwelling and community. These Harat (plural of Harah) may have been related by kinship, descent, common origin or function, but in any event they were assigned space within the evolving urban pattern on which to set out their own communal settlements; the details of their arrangements were left to them. The results were highly identifiable dwellings which expressed the personality, culture, occupation, social

habits and available resources of the local inhabitants.

This atmosphere prevailing in the traditional settlement areas where the environment is shaped to respond to user needs contrasts sharply with the sterile atmosphere of the large scale public housing projects in the E.N.T., which are based on inflexible and misguided design standards. Nowadays, the bureaucratic machinery of settlement planning is characterised by centralised decision making and little concern for user participation, which is only theoretical if it exists at all. These decisions always fail to meet the desires and needs of the people for local identity. The main cause of these mistakes is that the client (decision maker) of the E.N.T. is an admirer of other cultures and may be using Islam by name, but Islam is a way of life as discussed earlier in Chapter 2 (Cultural). The sharp contrast which exists between the recent planned development (E.N.T.) and the informal settlements (around Cairo) clearly reveals in the latter the continuance of traditional organisation of space. This suggests that the majority of the population still prefers a spatial organisation that fosters community interaction [15].

The second distinguishing characteristic is that the concept of Harah is closely based on the general principles of Sharia (Islamic law). Muslims have understood and observed their relationship towards the Almighty, and they have striven to undertake their personal and communal achievements through following the Sharia. "The objective of Sharia is preservation through the observation of its guidelines: the spiritual contentment of man, the physical and mental wellbeing of man and his descendants, the correct way of dealing with property. All of which have the ultimate aim of creating the healthy and virtuous individual, family, society and eventually the ideal world" [16].

The Islamic property law for instance is based on Sharia. It is

characterised by a highly differentiated set of property rights whose exercise is heavily contingent upon acceptance or opposition by proximate neighbours. There are many Quranic verses and sayings by Prophet Mohammad which order the care for humanity at large, the nearby community and direct neighbours [17].

'And serve Allah. Ascribe no thing as partner unto Him. [Show] kindness unto parents, and unto near kindred, and orphans, and the needy, and unto the neighbour who is of kin [unto you] and the neighbour who is not of kin, and the fellow-traveller and the wayfarer and [the slaves] whom your right hands possess. Lo! Allah loveth not such as are proud and boastful.' 4:36 (Pickthall)

'Do not harm others or yourself, and others should not harm you or themselves.' Ahmad and Ibn Majah (Ref. 7, p. 77)

The angel Gabriel kept exhorting me about the neighbour to the point that I thought he would grant him the right of inheritance.' al-Bukhari via Aisha (Ref. 5, p. 383)

'Do you know the rights of the neighbour... you must not build to exclude the breeze from him, unless you have his permission...'. Ibn Adi and al-Kharati (Ref. 8 Vol. I, p. 254)

« واعبدوا الله ولا تشركوا به شيئاً وبالوالدين احساناً وبذي القربى واليتامى والمساكين والجار ذى القربى والجار الجنب والصاحب بالجنب وابن السبيل وما ملكت ايمانكم إن الله لا يحب من كان مختالاً فخوراً »

سورة النساء ٤ : ٣٦

« لا ضرر ولا ضرار »

احمد وابن ماجه

« ما زال يوصيني جبريل بالجار حتى ظننت انه سيورثه »

البخاري عن عائشة

« اندرون ما حق الجار .... ولا تستعمل عليه بالبناء فتحجب عنه الريح إلا بأذنه ..... »  
ابن عدي في الكامل والخراطي في مكارم الاخلاق عن عمرو بن شعيب عن ابيه عن جده

This is in sharp contrast with the recent (non-Islamic) law whereby one's rights over property are limited by regulations which apply equally, generally and in advance. The Islamic property law recognised that the misuse of urban property or the creation of nuisance discommoded adjacent neighbours more than it adversely affected those living far from the scene. It is therefore left to informal agreements between adjacent co-residents the right to mutually restrict each other's property usage in such a way that urban development will not infringe on the privacy or property rights of each other [18].

Sharia has also imposed severe punishment for unlawful and anti-social relationships since these encourage the disintegration of the



family and may severely harm innocent children as well as spreading disease in the community. While Islam has opened the door to its utmost limit for marriage, it has forbidden contact between the two sexes outside the family circle except in special circumstances such as in the sustenance of livelihood, trade or education. Therefore the demand for privacy is highly regarded in Islamic society and is clearly expressed in Muslim houses, in their openings, roofs and courtyard gardens. This provides the individual family with the means of enjoying living in the dwelling, performing their activities in the spaces without being encroached upon by neighbours. The objective of this privacy is not for convenience's sake, but it is a basic requirement to preserve the family. There are many verses in the Quran which emphasise this privacy [19]:

- |   |  |
|---|--|
| <p>'O ye who believe, enter not houses other than your own, until ye have asked permission and saluted those in them: that is best for you, in order that ye may heed.' 24:27 (Ali)</p> <p>'If ye find no one in the house, enter not until permission is given to you; if ye are asked to go back, go back: that makes for greater purity for yourselves, and God knows well all that ye do.' 24:28 (Ali)</p> <p>'Say to the believers that they should lower their gaze and guard their modesty, that will make for greater purity for them, and God is well acquainted with all that they do.' 24:30 (Ali)</p> | <p>« يا أيها الذين آمنوا لا تدخلوا بيوتا غير بيوتكم حتى تستأمنوا وتسلموا على أهلها ذلكم خير لكم لعلكم تذكرون »</p> <p>سورة النور ٢٤ : ٢٧</p> <p>« فإن لم تجدوا فيها أحدا فلا تدخلوها حتى يؤذن لكم وإن قيل لكم ارجعوا فارجعوا هو أزكى لكم والله بما تعملون عليم »</p> <p>سورة النور ٢٤ : ٢٨</p> <p>« قل للمؤمنين يغضوا من أبصارهم ويحفظوا فروجهم ذلك أزكى لهم إن الله خبير بما يصنعون »</p> <p>سورة النور ٢٤ : ٣٠</p> |
|---|--|

The importance of privacy may be seen even in the relationship between the courtyard and the semi-private path (Atfa). This relationship, however, is not a direct one. It is through an entrance area (Magaz). It opens onto a blank wall to obstruct all view of the inside courtyard. Fig (4.8) shows the entrance area (Magaz) in Sihami House.

"Behaviour research today agrees that man also possesses the remnants of instinctive territorial behaviour. Paul Leyhausen is of the

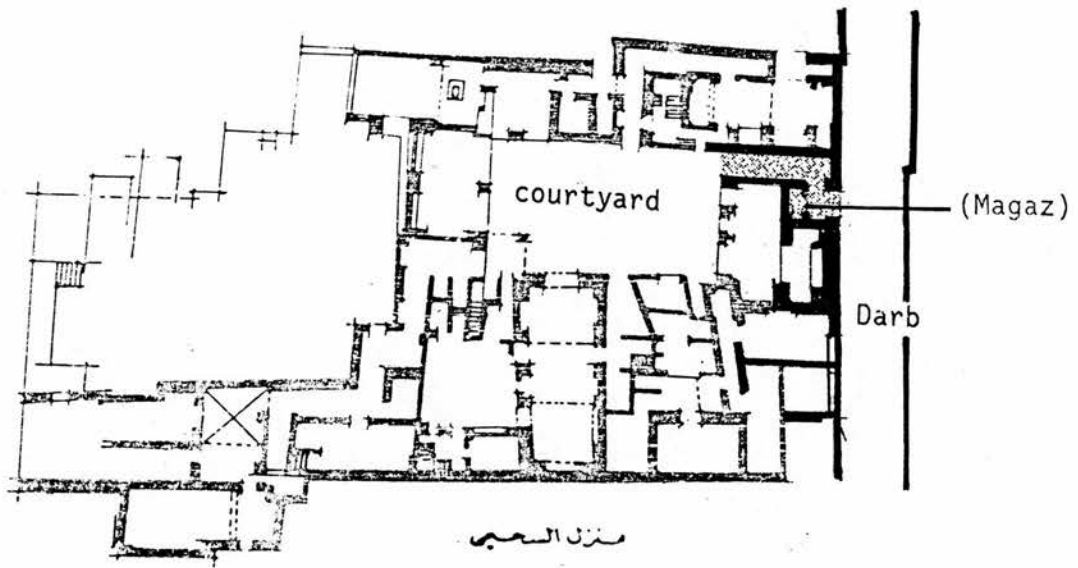


Fig (4.8) The main entrance area (Magaz) in Sihami House, Cairo (ed. A. Hyland op.cit, p31).

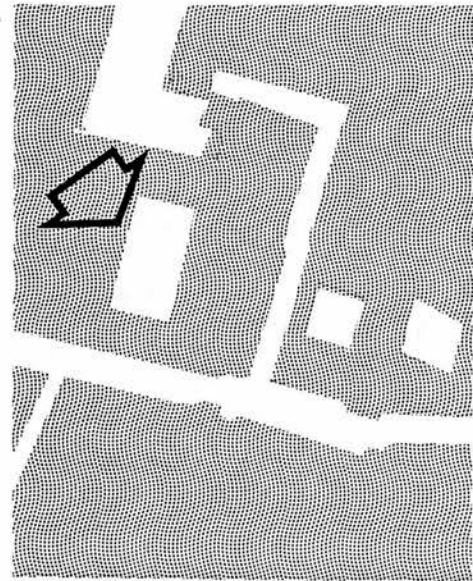
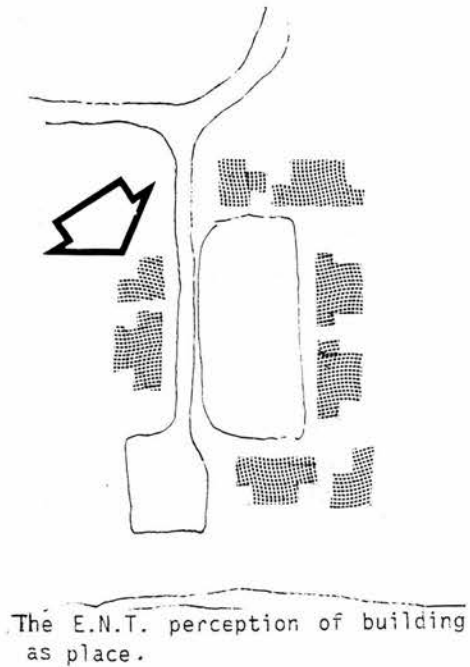


Fig (4.9) Shows the difference between the inward-looking and the outward-looking plan (drawing by the author).

opinion that garden walls, private property signs and the attitude that 'my home is my castle' are clear examples of this, as well as the way in which not only children but also grownups will hurry to mark their claim on the beach and get very annoyed at intrusion" [20].

The recent E.N.T. development has incohesive architecture, discord in the overall urban theme and extrovert structures that do not respect the Islamic principles or the functional human values mentioned above. This creates some obvious deficiencies when they set up dwellings whether of the separate house types or apartment blocks overlooking each other, for example, and destroying one another's privacy completely.

The scale and density of the neighbourhood is the third recognisable characteristic. The Harah is smaller and more compact than the recent E.N.T. neighbourhood. In the old quarters of Cairo, the longest straight section of any main street (Harah) does not exceed 300 metres, and is very much less in the side streets of the residential quarters. Thus, when walking from one part of the city to another, the distance one has to go is sub-divided into sections, each one easy to walk and each one having its individual identity. This makes a journey interesting and ensures the shaded street retains a human scale [21]. At the same time, the Harah concept with its high density and compact plan tends to make all activities accessible and reduces total trip distances, which increases the potential for short walking and cycling trips.

"Though the Harah is a through street it does not encourage outside traffic: it is narrow and crooked, and from its entrances it appears to be a cul-de-sac. The outsider is therefore apt not to notice it, and the people who do enter clearly have business there either as residents, people visiting residents, or customers for one or other of the shops and services. The inhabitants are well-known to each other, and strangers with no apparent business in the neighbourhood are likely to be

questioned. The physical plan of the Harah in this way determines its social life as in a village, relationships will be close, the sense of community will be strong, and attitudes towards the outside world somewhat suspicious" [22].

The physical structure of Harah has mainly been based on extended family houses which create close family ties and a high degree of tolerance to population density without displaying noticeably neurotic reactions. Nowadays, family structure has somewhat changed from extended to nuclear families, but strong extended family relationships are still maintained.

Again, the concept of the E.N.T. neighbourhood unit focused around schools with a walking radius of 500 meters seems unsuccessful. It is not comfortable for anyone (especially children) to walk for 500 meters in the bare, harsh desert climate, especially in a plain where there is no attempt to provide shade for footpaths. At the same time the rate of car ownership is very low, if compared with an advanced nation or other developing countries (the Cairo average of car ownership is 13/1000 persons). So the design of a neighbourhood in the Egyptian desert must depend on preserving the human scale, and the maximum distance through a neighbourhood should be reasonable under the climatic conditions. At the same time, the E.N.T. neighbourhood with its low density means the neighbourhood extends in the horizontal direction. This contradicts the main aim of the planning concept of the E.N.T. which is intended to minimise the distance between work and home permitting a large part of the necessary movement by foot or bicycle. Also, the isolated small families and single dwellers in the E.N.T. have a great passive influence on social life for the new residents. Thoughtful development schemes for E.N.T. should take special care not to destroy extended family structure, but to encourage it instead by providing suitable

housing and settlements.

The fourth notable characteristic is the hierarchy of space and its function. This may be recognised in different features:

- i) In most of the E.N.T. neighbourhoods, public green space occupies 15-20% of the land use of the neighbourhood. This concept is an alien notion to the pattern of space for traditional Egyptian cities. In most hot and arid areas of Muslim cities, less than one percent of the total land surface has ever been utilised as public green space. Instead, the promotion of private open space as "courtyard gardens" has been the common practice. When settlements were smaller and nature more accessible, the proximity to nature was fulfilled daily by private courtyard gardens. The large scale public green space concept is not recognised in the traditional city. Even if found in slightly larger scale, it was surrounded by walls to keep out the surrounding desert with its dust-laden winds and to give privacy and protection. In the residential areas of the E.N.T., the public green area appears to be an indispensable corollary to apartment-block living, but this pattern is totally alien to most Muslim countries. Groups of indigenous private courtyard houses can accommodate the same population density as a medium-rise apartment block, if careful measures of light availability and space separation are observed [23].
- ii) The second feature is the orientation of buildings and open spaces. There is a basic fundamental difference between the traditional *harah* which has been based on an inward-looking plan and the E.N.T. neighbourhood based on an outward-looking plan. Fig (3.65) above shows the difference between the

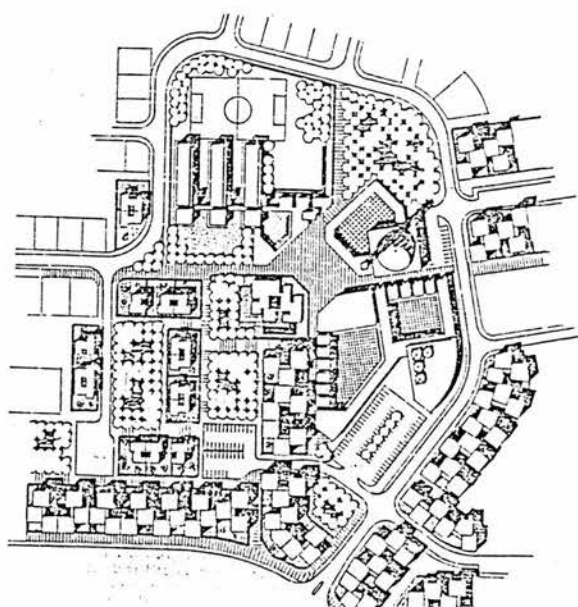


introvert and extrovert concepts. The open space within the traditional urban form of the harah is always perceived as place, in contrast to the E.N.T. perception of building as place (Fig (4.9)). The inward-looking plan closely serves Egyptians, both culturally and physically.

- iii) The third feature of the hierarchy of space is that in the Harah concept, the "four-fold" rather than the recent E.N.T. "bi-fold" division of space was the main characteristic. The Harah comprises a system of public, semi-public, controlled semi-private and private; varying in degrees of accessibility and enclosure. On the other hand the E.N.T. concept has only the public and semi-public types of space. Fig (4.10) shows the division of space in the Harah concept and in the E.N.T. neighbourhood concept.

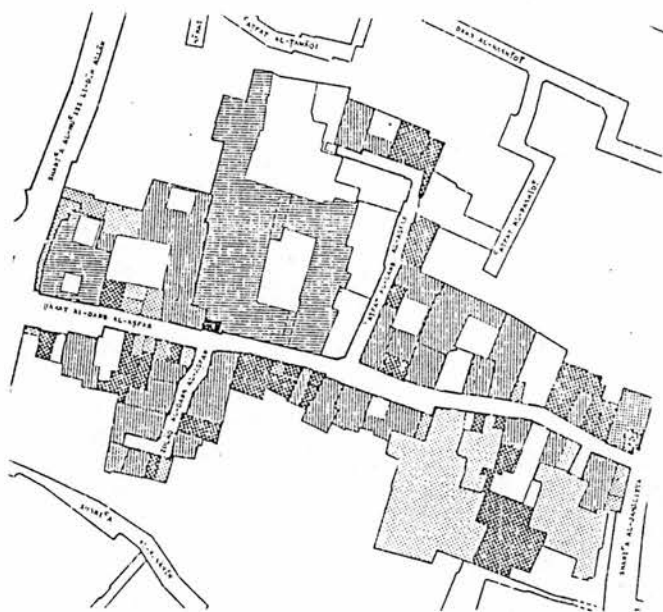
The division of space in the Harah concept (four-fold) is an outcome of social and functional needs. The types of spaces were distinguished by their different principles of design (especially needs for privacy and function). This is in contrast to recent E.N.T. types of spaces which were distinguished by their relative widths.

The intervals between the four types of space in the Harah concept provide a social amenity, but with the clear separation of public and private spaces particularly, the privacy of the home is never violated. The hierarchy of space and movement concerning privacy is an admirable system in the Harah concept. The residents leave their houses starting from the entrance hall (Magaz) or private courtyard with its bright and attractive privacy where most of the family life takes place, to the adjacent area (Atfa or Darb) - with a lesser degree of



The concept of recent E.N.T. neighbourhoods

"bi-fold"



Concept of traditional neighbourhood (Hara)

"four-fold"

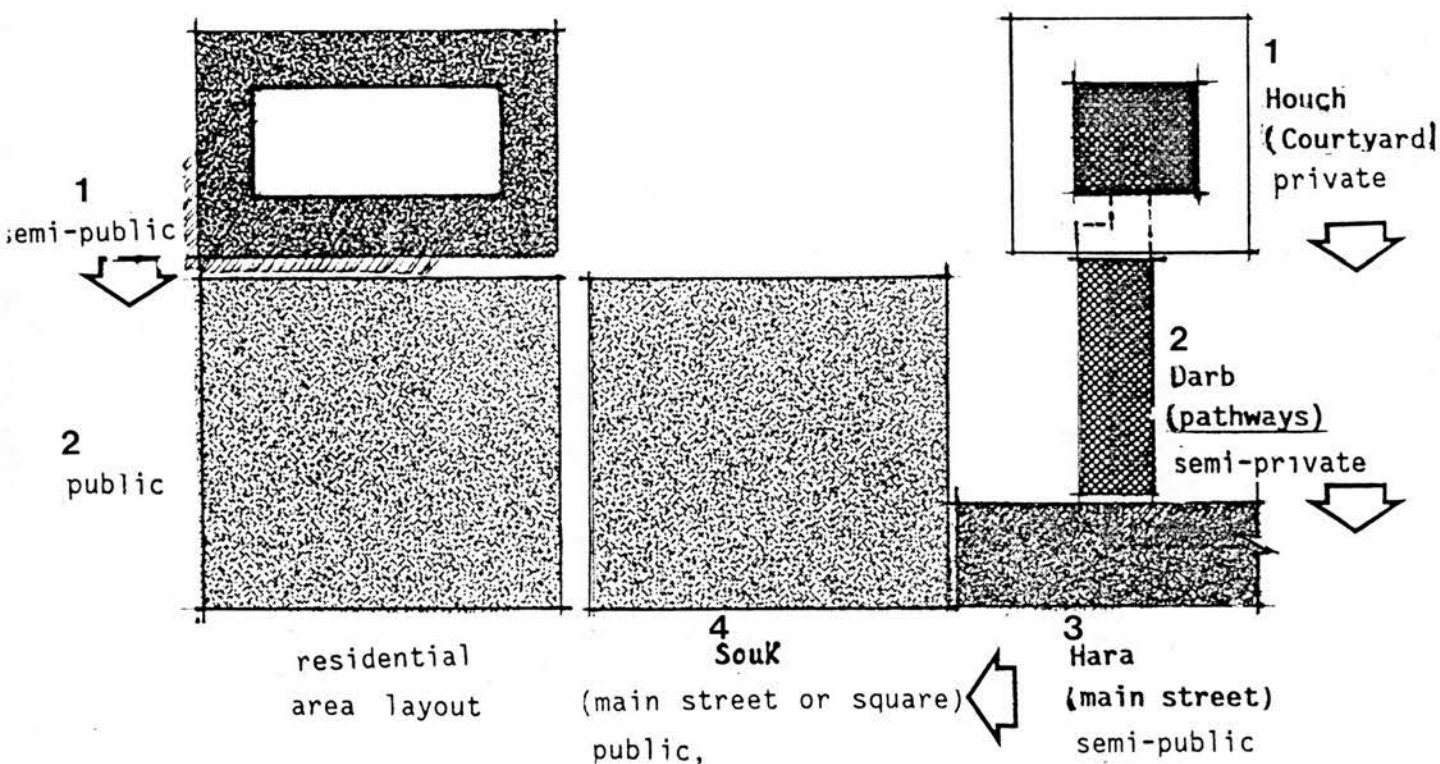


Fig (4.10) The division of space. There is a recognisable heirachy of multiple levels of linked spaces and functions from the scale of main street (Hara) to that of the front door area (Zoquk). The recent E.N.T. concept has two types only (drawn by the author).

privacy in a narrow, dimly lit lane outside; moving then into the places which belong to the inhabitants of the immediate neighbourhood (Harah). There is a progressive loss of privacy and an increase of public identity as they travel along the lane and enter the communal street of the Harah, where they come out of seclusion into the openness of public spaces. Arriving at the Souk (main street or square) one reaches the maximum extent of public identity. On the way back to their homes, the residents return to their privacy, also gradually but in the reverse order.

Typical Islamic neighbourhood dwellers have been described as moving through a series of spatial enclaves from most private and individualistic to most public and plural, their behaviour adjusted according to spatial sequences they experience [24].

- vi) The fourth feature is the open space pattern and its real function. The basic needs of man may be interpreted by his own actions. Therefore his actual needs for open space within the residential areas may be defined by examining his behaviour with the open space. Within the Harah concept the residents as Muslims need total privacy for their family life which calls for clear separation from the other activities. At the same time they need to participate in community life. Therefore there are two groups of activities. One needs total privacy (family life) which takes place in the private courtyard open space, the other needs a participation in community life which takes place in the public main street (Souk) and in and around the mosque. Fig (4.11) shows the Muslim life and its needs. From the previous figure it may be noted that there are only two types of space out of the four

types mentioned above that are used for private and general activities of the residents (private open space and public open space respectively). The two others, semi-private and semi-public, (harat street and Atfa) are used for circulation only. They could be described as intermediate areas for transition between private and public spaces. These two spaces are limited to the minimum for the use of pedestrians, and also formerly designed and dimensioned according to the means of transportation available (i.e. horses and camels). Most of these external spaces are small and completely stone paved enabling the residents to maintain them with ease. One can easily see that the Islamic law (Sharia) is an underlying cause of the above feature. One of the sayings by the Prophet is [25]:

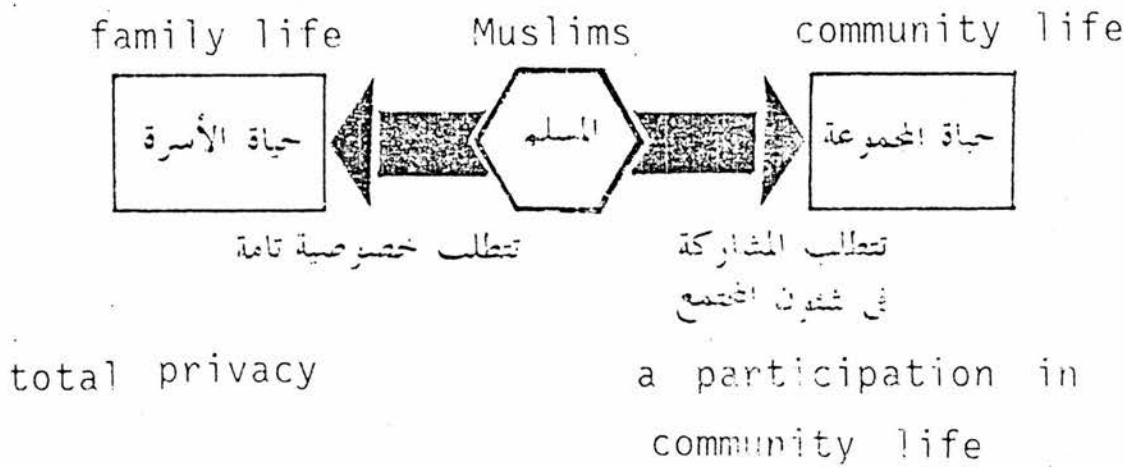
'Avoid sitting on thoroughfares', they said it is difficult to avoid as it is our gathering places where we spend time talking, 'but if you insist then you should respect the rights of thoroughfares'. What are these rights they asked, 'Avoid staring, do not create harm, salute back to those who salute you, bid to honour and forbid dishonour.' Abu Said al-Khadari (Ref. 6, p. 284)

« ايّاكم والجلوس على الطرقات » فقالوا  
مالنا بد انما هي مجالسنا نتحدث فيها « فاذا  
أبستم إلا المجالس فاعطوا الطريق حقها »  
قالوا وما حق الطريق « غض البصر وكف  
الاذى ورد السلام وامر بالمعروف ونهى عن  
المنكر »  
أبي سعيد الخدري

In conclusion, one can confidently argue that all these foregoing principles are not outdated, in fact they have a remarkable congruence with most modern principles of city planning.

As J. Abu-Laghod puts it "Islamic principles of urban design and regulation are not archaic. Indeed, with modern aims in mind, they are capable of creating contemporary cities which hold a promise of being as beautiful (in a different way) as were the great cities Islam generated between the 10th and 17th centuries and which are as functionally effi-

cient and adapted to modern life as were those earlier successful models. The principles are still valid and indeed are being rediscovered in the West. It would be tragic if they are forgotten by the very societies that invented them" [26].



**Fig (4.11)** The Muslim life calls for total privacy which demands a complete separation of public and private spaces, while at the same time requiring participation in the community life (Shalapy, "Housing in Islamic Cities", Arabic, Cairo, 1986, p218).



## Notes and references:

- [1] Laurie, M., "An introduction to landscape architecture", New York, 1975, p83.
- [2] Ibid, p90.
- [3] Ardalan, N., "Place of public gathering", The Aga Khan Award for Architecture, 1980, p5.
- [4] Sioufi, M., "A Fatimid Harah: its physical, social and economic structure", The Aga Khan Program for Islamic Architecture, Harvard Univ., 1981, p8.
- [5] Lecock, R., "Conservation in Islamic Cairo", The Aga Khan Award for Architecture, 1985, p49.
- [6] Serageldin, M., "Changing roles and procedures in the design of public building", The Aga Khan Award for Architecture, 1980, p18.
- [7] Ismaila, A., "Origin, ideology and physical patters of Arab urbanisation", Univ. of Karlsruhe, Ph.D., 1969, p136.
- [8] Abu-Lughod, J., "Contemporary relevance of Islamic urban principles", Ekistics 280 Jan/Feb 1980, p7.
- [9] Sioufi, op.cit, p8.
- [10] Abu-Lughod, op.cit,, p8.
- [11] Moustapha, A., "Islamic values in contemporary urbanism", Albenaa, Vo.7, No. 41, May/Jun., 1988, p18.
- [12] Sabbour, "The planning of Sadat City", 1980, p4-91.
- [13] SWECO, "Tenth of Ramadan new industrial city", Master Plan, 1976, p56.
- [14] Porter, W., "Architecture in Islam: The search for form", The Aga Khan Award for Architecture, 1980, p3.
- [15] Serageldin, op.cit, p24.
- [16] Moustapha, op.cit, p19.
- [17] Hakim, B., "Arabic-Islamic cities", London, 1986, p143, 152, 154.
- [18] Abu-Lughod, op.cit, p19.

- [19] HaKim, op.cit, p145.
- [20] Lötsch, B., "In search of human measure", Garten + landschaft, 1/84, p37.
- [21] Hyland, A., (ed.), "Housing in Egypt", Univ. of Newcastle, 1986, p30.
- [22] Sioufi, op.cit, p25.
- [23] Ardalan, op.cit, p10, 11.
- [24] Khan, S., "The influence of Arabian Tradition on the Old City of Jaddah: The Urban Setting", S. El-Sadek (ed), "The Arab City", Saudi Arabia, 1982, p195.
- [25] Hakim, op.cit, p147.
- [26] Abu-Lughod, op.cit, p10.

## 5.1 INTRODUCTION

While a completely fresh approach is needed in the planning of future Egyptian new towns at least some thought needs to be given to ways of improving mistakes made in projects like Sadat city and 10th of Ramadan. Recent areas can be improved initially by making use of simple means, such as the better use and design of existing green areas and open spaces.

One and a half billion Egyptian pounds had been spent on the E.N.T. plans in seven sites up to the year 1986. The number is expected to rise to 5.8 b E.P. by the year 2000 [1]. From the previous parts, it is clear that the E.N.T. desert concept does not address the ecological and social needs of the people and the place. The E.N.T. concept does not treat the desert as a desert, but it tries to modify the desert area to fit an imported concept from a non-arid area. As a matter of fact, all these billions of pounds will eventually simply be rendered worthless and wasted by the extreme desert environment. These new towns and their residents are going to pay a high price, socially as well as economically. This necessitates an attempt to save these new towns. This chapter intends to achieve this by the following steps:

It will closely examine a selected typical residential area in the E.N.T. including the residential use of open space. The problems identified will then be judged against the findings of the previous chapter (Chapter 4) and conclusions drawn. These will then be theoretically put to the test for future practice in the form of a new proposal for improving and redistributing the space of the selected area to best possible advantage, in order to make the best of a bad job.

In planning, the main task is to provide an urban form which achieves and protects the functional balance between man's user needs and ecological and economic factors. The identification of user needs is not an easy task. A direct solution to this problem could be achieved by the participation of the users in the planning and design process provided, of course, that they could be identified. But there is also an indirect method to define residents' needs - a method based partly on observation and partly on examining the behaviour of the residents. It is based on the assumption that the actual needs of man may be inferred and interpreted from his actions [2]. This latter method was the one adopted in the present study as it was best suited to the modest resources of the author.

### **Selected area**

A typical landscape scheme of a residential area in E.N.T. was chosen for the study - a small site located in an established neighbourhood, in 10th of Ramadan New Town where most of the roads, landscape, services and neighbours already existed. Fig (5.1) shows the location of the selected area within the neighbourhood No 2. The area was built in 1979-1980. Most of the landscape construction took place in 1980-1982, but there is some area still under construction.

This site was selected because it is one of the earliest developments of the E.N.T. (ten years) and is considered as a good example of landscape design from the viewpoint of the E.N.T. authorities. It is typical of the residential areas that form most of the E.N.T. neighbourhoods. In view of the fact that the landscape design is not always immediately perceptible, the effectiveness of planting and landscaping decisions or policies can often not be appreciated for two or three decades. Therefore, the indirect observation technique will be used by examining other residential sites of 15 or 30 years' development which

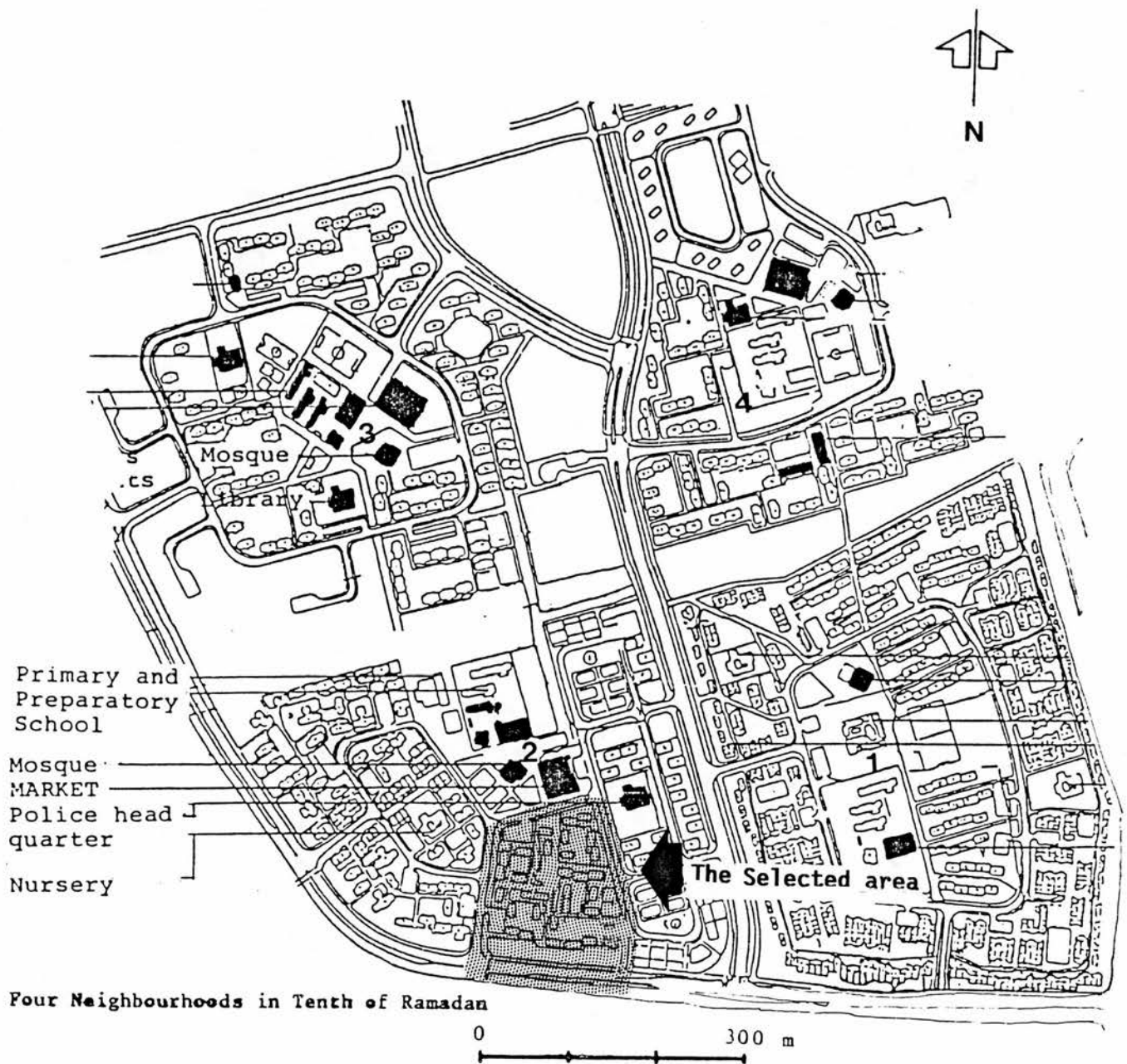


Fig (5.1) The location of the study area within neighbourhood No. 2 (10th of Ramadan). The area is one of a typical early residential site (1980) that could be a good indicator of landscape design standards (SWECO, Growth Plan, 1982, p23).



are in similar situations to the E.N.T. in order to help explain the present and predict the future.

The selected area was visited three times within 10 weeks' field study to E.N.T. Site investigation was done, followed by interviewing a random sample of some of the households to provide background details of the residents' attitudes and their use of open space. Site observation (by camera and sketches) was undertaken to record a typical day's activities for the residents and the usage of open space (walking, traffic, playing and other activities). (See Field Study Index.)

The development (selected area) consists of clusters of houses (four-storey blocks of flats). The ground floor flats are about 30 cm above ground level, and each has a balcony with no direct access to the surrounding open space. Fig (5.2) shows a view of the selected area. The space between the widely spaced blocks is largely unused. Almost all the open space is completely visible from the flats. The land form is levelled and there is no earth modelling. With the exception of some planted trees and a grassed area, there is no other opportunity for outdoor activities; the space is obviously made little use of by residents. Fig (5.3) shows the selected area and its recent concept of heavily irrigated spacious common landscape area outside the dwellings underlying its design.

## 5.2 FUNCTIONAL CONDITION

Any landscape design concept in a residential area should at least serve a basic number of functional requirements for its residents. An adequate usage of space, convenient circulation (pedestrian, car) and satisfactory provision for human needs such as privacy, safety, identity, comfortable living - these are some of the requirements.

### Usage of space

From the site observation and interviews with the residents it was

Fig (5.2) View of the study area. It shows a typical four-storey block of flats which dominates the site (photo by the author).

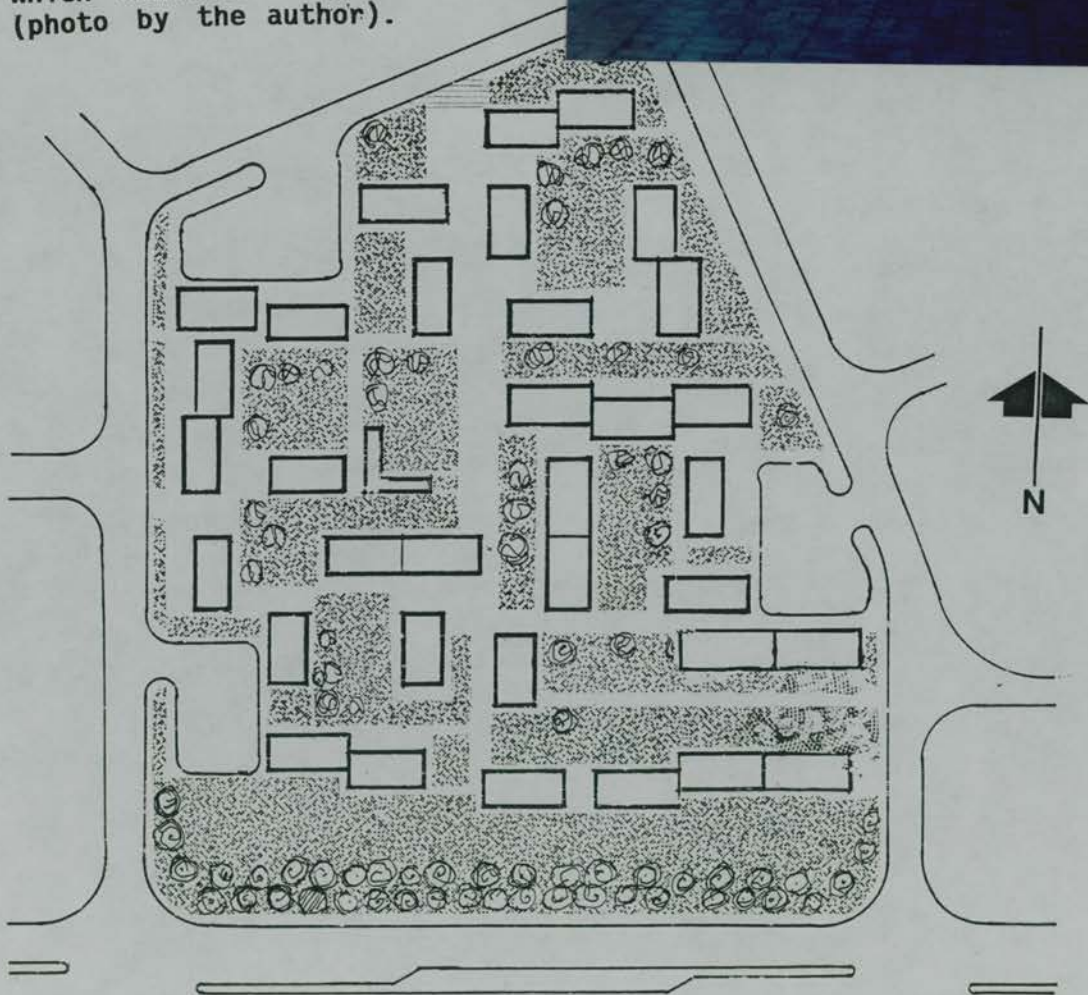


Fig (5.3) The study area with its heavily irrigated spacious common landscape area outside the dwelling. A typical formal landscape concept of a grass area and a few trees planted with formal pathways (SWECO, op.cit, 23 and detail by the author).

quickly apparent that the four-storey form of housing and its surrounding landscape were not acceptable to many of the villagers, some of whom under the Egyptian law had squatter's rights to the land. Most of the families in the study area used to have a private open space or courtyard. The walk-up apartment blocks were ill-suited to the traditional keeping of poultry and small domestic animals, which are a main source of protein for the poor. Within the selected site people keep the poultry on their balconies and their domestic animals graze in public green areas. The new plants have an impossibly difficult time. They have to withstand the grazing and attacks of browsing goats which eat most plants to which they have free access. The previous situation may be considered as a first stage of land use transformation for the open space of the selected site by using the open space in a way completely different from the intended design.

A similar development (new district) at Port Said (seven years older than the selected site) shows the next stage of open space land use transformation. The residents of the ground floor flats have fenced an area near their balconies and considered it as a private garden. Some have used a few trees with light structure to make a boundary for the area to keep football players out of their flats (Fig (5.4)). Others have put up fences with climbing plants to create their own gardens and here they grow vegetables and keep poultry (Fig 5.5).

Other examples may be quoted. In the Workers City (Helwan) (30 years old) housing form and layout has the same characteristics as most of the recent E.N.T. developments. It is made up of five-storey blocks of flats originally built in a formal layout with relatively wide spaces between blocks. Throughout the city the area has been transformed by the people's own extension activity into an urban layout of narrow streets much more suited to the harsh desert climate of Egypt. Fig





Fig (5.4) The resident of the ground floor has planted some trees and made his own boundaries with waste wood. This stops public access to the gable end area, which is considered the main source of noise intrusion (photo by the author).



Fig (5.5) The resident of the ground floor has established a railing fence in the public area to create his own garden with direct access from his balcony. He grows vegetables and keeps poultry there (photo by the author).

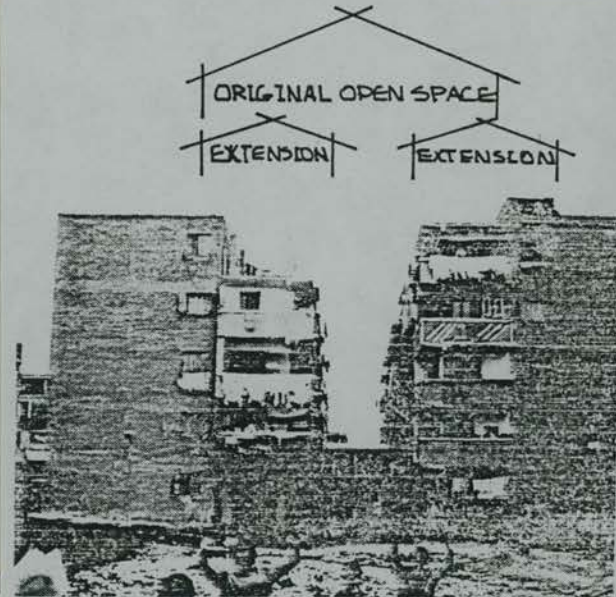
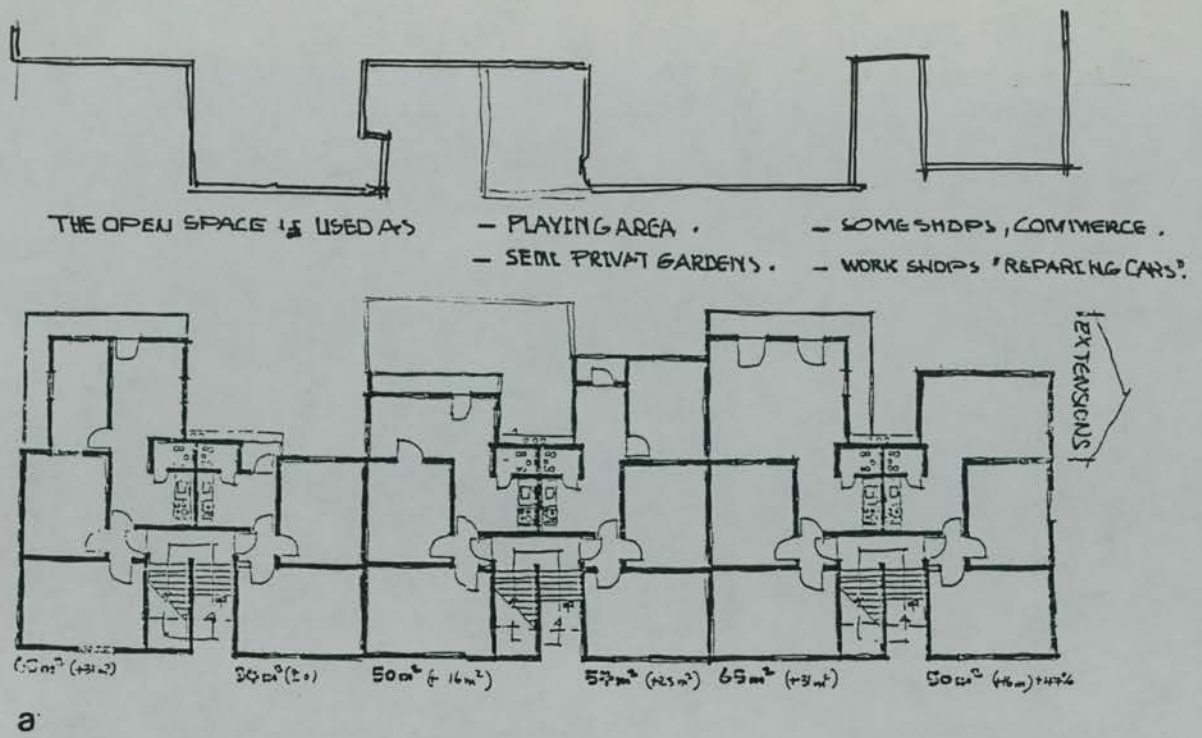


Fig (5.6)

- Plan of the informal extension for the block.
- Extension of four storey block of flats, workers city Helwan.
- An end "cross-section" showing a standard support to all units vertically and horizontally. Individual infill is "controlled" by the support system. At urban tissue level new street width is better suited to the local climate than as originally planned (Tipple, G. et al, "The transformation of workers' city Helwan", Open House International, vol. 10, 1003, 1985, p32,34).



(5.6) shows the extension in plan and a general view of the buildings. In some places, public open spaces have been made private. The residents of one block have fenced off the space in front of their dwellings and now grow vegetables there in private gardens [3].

### **Circulation**

Not only is the landscape of open space between houses the important element to be considered in residential areas, but the landscape of service areas (pathways, roads, parking) within the residential area must also be totally designed and landscaped to become an integral and pleasant part of the environment.

The complete separation system between the pedestrian and roadways is the dominant feature in most of the E.N.T. planning concept. Fig (5.7) shows the selected area where it is served by the local road which goes around the area, and the pedestrian pathway is designed to be in the internal part of the area. In spite of the fact that this system ensures privacy, quiet and safety for residents it has not proved to be successful in the Egyptian context. Most of the planned pathways for the selected site appear to be lifeless and a very small number of residents use them. People on the other hand make heavy use of pavements behind vehicular areas (Fig 5.8). Evidence suggests that people make a deliberate choice to use the vehicular area to reach the central area even though the distance is shorter by using the separate footpath. "People did not seem to recognize these demarcations of space and ignored them where they interfered with their normal patterns of living. Planning, in effect, gave way to common usage. Such scenes are typical of city residential neighbourhoods everywhere" [4].

This is not surprising; the streets (especially the main ones) are the focus of intensive social interactions in the traditional urban form. The footpath system through spacious open space is new to most of

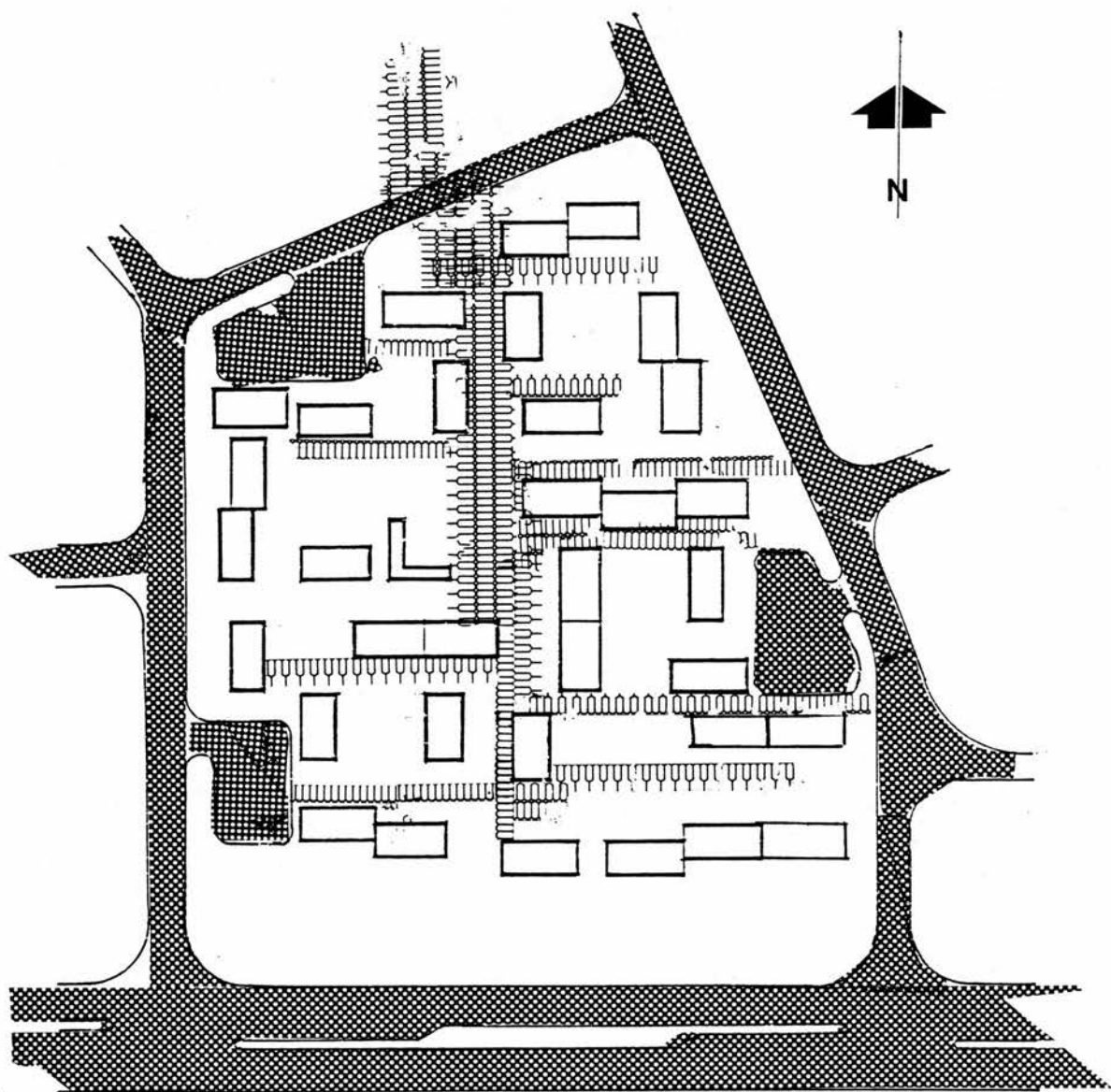


Fig (5.7) The planned circulation system of the study area (SWECO, 1983, Growth Plan, details by the author).

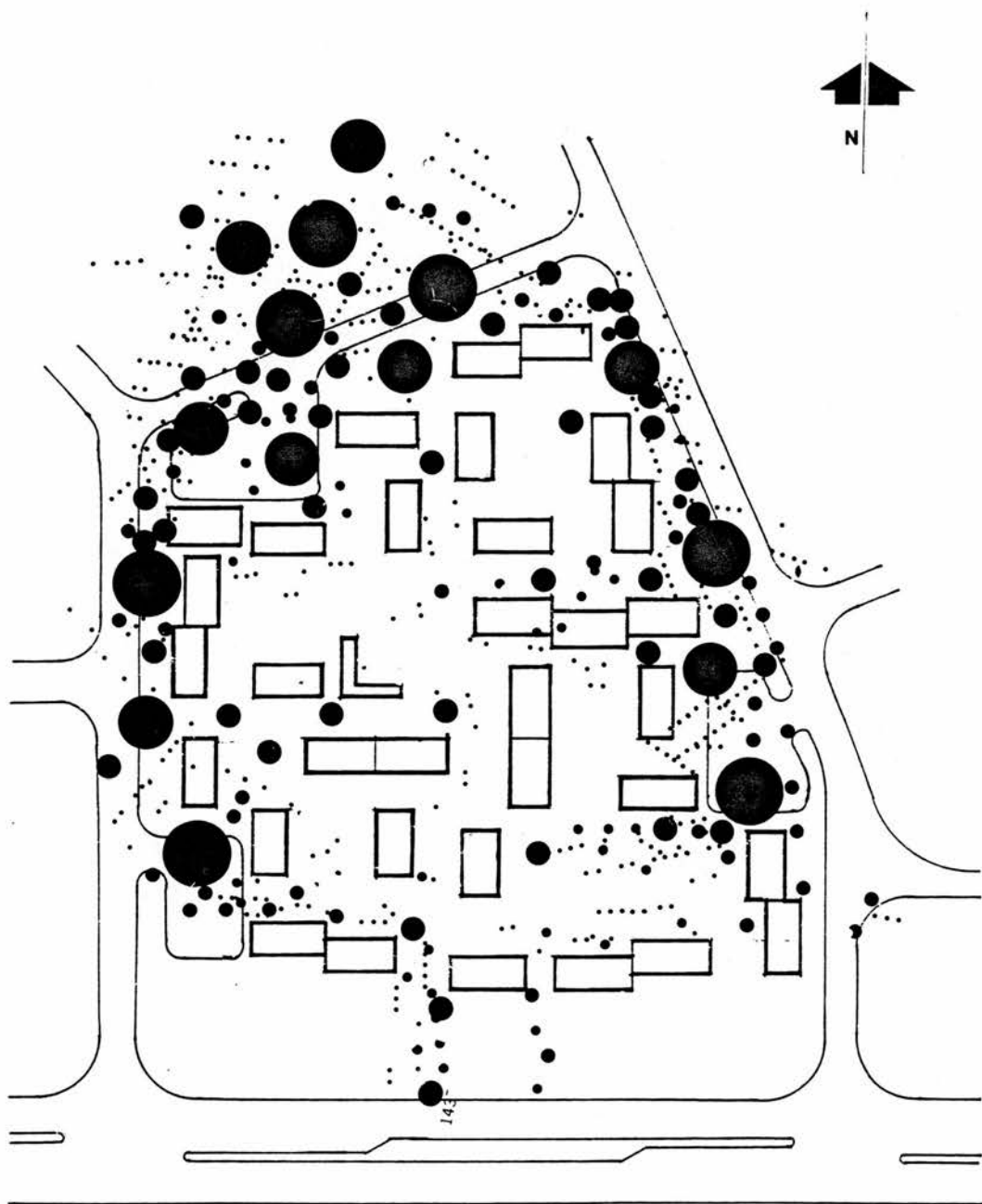


Fig (5.8) The heavily used area. Most of the people have been observed in the street areas (drawing by the author).

the residents who come from traditional areas. In the traditional urban form the footpath is always combined with other vehicular roadways, but the speed for these vehicles is very reasonable to the pedestrian movement. This attitude has continued with the residents in most of the E.N.T. developments. The observation of the site also showed that great social activity occurred on space officially designated for vehicles only.

"The tendency to use streets in this way, as social space, is spontaneous and natural. Since time immemorial the natural function of the street has been as a focus rather than as a separator of social activity. Modern perceptions of space use, enshrined in the by-law and planning regulations, imposes fixed uses and an inflexible mould on community environments that are at variance with the realities of human behaviour. The official designation of parks for recreation, roads for vehicles and sidewalks for walking are thus ignored. People use streets because in large measure they are the best places to do certain things that parks cannot provide" [5].

The design of footpath systems within the selected area also has failed to recognise pedestrian desire lines. Most of the footpaths in the site were designed with meaningless order in formal shape parallel to the building edges and these are dictated by road patterns. Fig (5.9) and Fig (5.3) above show one of the main footpaths within the site. Pedestrian movement is fluid and will not negotiate right angles through choice. In general, pedestrians and vehicles may be combined in one circulation system which maximises pleasant views for occupants of vehicles and minimizes construction and maintenance costs for roadways and footpaths. At the same time this may provide an active space which promotes social interaction for residents and meets the pedestrian desire lines.



Fig (5.9) The central pedestrian way is flanked by open space in a very rigid order. It has been planned with regard to the building which followed the main road order (photo by the author).



Fig (5.10) Most of the residents have closed their balconies with wooden shutters to achieve their internal privacy (photo by the author).



In the 10th of Ramadan New Town (place of our selected area), the roadways and parking areas consume approximately 25 percent of the total area. In spite of the road system occupying such a great area, the observed vehicles within the site are very few. The car parks, which are partly located on the edge of the selected site, are used in limited areas. These parking areas remain generally empty. The planned parking area is much greater than the actual requirement.

Ambiguous spaces are very common because most of the access roads were located before buildings in the design stage. This is in great contrast to the traditional urban form where most of the local roads were located after buildings. "The environmental conditions (sun, wind, view, privacy) determine the siting of open space and building and that building location determines the route of the access road" [6].

#### **Other functional requirements**

The selected site will be examined here from the view point of recreation and other amenities. Recreation is considered a key factor in the success of cluster housing, with open space necessarily designed as a leisure time resource.

Unfortunately, neither the active recreation which requires special facilities (such as tennis, basketball, football or swimming), nor the passive recreation which is possible whenever one is out of doors and does not need any facilities (such as walking, sitting, viewing, relaxing), seems to have been considered in the selected site. In spite of the vast open space, there are no recreation facilities for children's play areas.

From observation of the selected site it was noted that most toddlers play near the threshold of their homes or on the common stairs of their flat blocks. They play with wheeled vehicles, balls and other toys. Older children's activities are slightly different from those of

toddlers. They play within the open space near their homes. Walking, standing, running, racing, wandering around, playing with balls, playing catch and tree climbing are the most common open space activities for children. Children were seen most often on public paved space, and approximately as often on roads or car parks as in green open space. In general toddlers and older children were more often seen using hard rather than planted areas. Within the green spaces there are no play facilities for children to encourage them to play there. Even when children do play in the green areas they dig the soil and uproot small trees and shrubs. This, of course, is a form of play. Egyptian children are largely unaware of the need to preserve the environment. It is therefore not easy to maintain green areas when there are plenty of active children.

Among adults walking was the most frequently observed activity especially after sunset and at night time. Many families used the open space for taking a walk. Egyptians prefer to have a walk through the nearest neighbourhood open space, especially the main public one. They disliked walking through their E.N.T. neighbourhood because they felt overlooked by others who knew them. This means people need privacy even when they are outdoors. The next most observed activity was standing on the threshold of their houses to have a chat with a neighbour or further away in public areas. In general, most of the daytime leisure of Egyptian adults is devoted to sitting in the shade rather than to sports activities and other active forms of recreation. The pace of life is fairly slow. The value of open space for adults is primarily visual.

The last group to be considered were the teenagers who form a very small proportion of the population of the observed site. Their observed activities were walking, playing ball games in large level areas (parking areas) and sitting or standing chatting with each other.

Satisfaction with the appearance in the selected site was not clearly expressed. Most of the residents were satisfied with the new environment as a whole, but they did not like the five-storey walk-up flats built in monotonous rows or around large open spaces. Most of the buildings, they felt, looked essentially the same and lacked variety and identity.

### **Human needs**

The landscape concept of the selected site will be examined to see how it satisfies the needs of privacy, safety, identity and comfort.

### **Privacy**

As mentioned before, the recent type of green space between the flat blocks always looks lifeless. Nobody was observed using the semi-public green space within the site except for some children. The main reason for this was that this type of space does not provide any privacy in the sense of privacy as understood by Egyptians. It is overlooked by neighbours who may prefer to sit on their first- or second- or third-floor terraces in the afternoon (Fig (5.9) above). The simultaneous use of the green space invariably led to social tension between neighbours.

A testimony to the feeling of lack of privacy when using the green spaces was provided by some of the residents who occupied the ground floor flats. When asked about how they used these green spaces they replied that they only used them for walks in the afternoon. They strongly objected to the idea of having a picnic on the grass areas in front of their flats because of lack of privacy. In fact, most Egyptian families feel discouraged from using green spaces in any situation where they may be overlooked by others. This may explain why most of the open spaces between dwellings are not used. Unit windows and balconies, facing the windows of other units, create overlooking situations which diminish individual privacy and limit window use. Some people closed

their balconies with wooden shutters to provide their internal privacy (Fig (5.10)).

The landscape design for these residential areas is also unsuccessful for achieving privacy. Most of the ground floor residents felt lack of privacy. They are exposed to all and everything that goes on at ground level. Children play football against their walls, people peer through their windows and so on. Fig (5.11) shows a footpath passing too close to first-floor residents' windows and balconies. There is no transitional zone between public and private space, the degree of privacy given to the dwelling is reduced or entirely lost.

### **Safety**

The desire for privacy is often coupled with another objective: the security of residents and their possessions. Neither the way in which the houses of the selected site are sited and shaped, nor the way in which access to open space is located seems to have seriously considered the security and safety of the residents. From the site investigation, most of the ground floor flats are not occupied as a result of the lack of security. At the same time many families do not allow their children to go out and play in the green open space because they feel it is too vast and not easy to supervise.

By contrast, the traditional urban form where most of the buildings are inward looking, has a high degree of natural protection. In most cases the building surrounding the private courtyard achieves high security for its residents. The semi-private spaces (Atfa) (cul-de-sac) provide more security for the inhabitants, because they exclude nearly all strangers and passers-by. Even in semi-public spaces (Hara) every resident in the place is familiar with the people who use them, by meeting them in shops or in the street. The Hara always has a main gate which is closed late at night. In general the open space in the



**Fig (5.11)** People pass too close to neighbour's windows and balconies [photo by the author].



traditional urban form is limited and is easy to control and secure. It could be described as a self-security system.

### **Identity**

Identity is an important task for the designer and user. Everyone seeks to maintain this individual identity. Unfortunately, identity seems to be lost in the site under study and in other sites in the E.N.T. developments. The industrial methods and mass production of buildings for the government housing style have an inevitable anonymity which has led to the removal of any individual character within these new residential areas, which, besides being monotonous and anonymous, show disagreeable traits of undefined space. Most of the residents were not satisfied with these buildings as a dominant feature in the landscape.

In less dense areas such as the E.N.T. developments where buildings tend to be separated and have a lack of identifiable form, open space should provide the unifying element and identity of space. Identity can be developed through different ways. Landscape design plays the major part to achieve this identity. Plants, landform, water and building may help create distinction. Architectural form and open space size and shape should be considered in the first stage to provide identity. Most people want their area or at least their immediate neighbourhood to stand out and to be recognizable.

### **Comfort**

From the site observation, the desert environment (no rain, hot sun, temperature extremes, occasional dust and sandstorms) has an enormous effect on the Egyptian's daily life cycle. The cycle is dictated by the sun. The waking day is divided into three parts. Most of the activity takes place in offices, factories and schools in the morning. It is concentrated in the morning hours from six until one

o'clock in the afternoon. Afternoons are devoted to lunch and rest at home. Seldom could anyone be found doing any on site activity in the outdoor space at that time. The late afternoon and evening are times for shopping, visiting or participating in leisure activities. Most of the residents, especially children, were outside near sunset and after. Therefore lighting is an important aspect of any landscape scheme because so much of the activity takes place after dark especially in summer time. During the day, as previously mentioned when people participate in any outdoor activities, they tend to occupy shaded space.

Obviously, the creation of comfortable conditions around and between buildings is extremely important. Unfortunately, neither the landscape design nor the building design and arrangement answered the comfort needs of the residents. Large lawn areas and few shade trees did not provide sufficient shade to ensure comfort. Even the parking areas were a problem. Cars in the direct light of the sun in the desert are unbearable to touch or sit in, therefore shaded spaces need to be provided here too.

In contrast, the traditional urban form provides a more moderate microclimate. The compact form breaks the strong, hot dry or cold night winds, reduces the abrasive effect of dust storms, builds in cool air and shade and therefore encourages movement. The narrow streets and small spaces between them actually extend the hours of the day and the period of the year in which such facilities can be used.

Changing the scale and size of open space by added building is not easy in the typical existing E.N.T. situation. The landscape and its elements however have a greater part to play in improving the situation. The urban wooded landscape concept for example may be used to subdivide the recent vast spaces into a series of secondary spaces which give the opportunity to establish human scale and comfort.

Protection from noise intrusion is essential also for human comfort, the main source of noise being from children playing in the open space near houses. Most of the residents complained mainly about children and toddlers playing in the common stairs of the flat blocks. In the site scale, there is no adequate buffer to protect homes near the main roads from the noise of cars. A careful arrangement of noisy recreation activities should be considered. They should be located far enough from units to ensure privacy and quiet. If they are located near units, they should be separated by a good planted buffer.

### 5.3 AN IMPROVEMENT FOR THE SELECTED RESIDENTIAL AREA

The improvement of the quality of life in the existing open space area is the main objective of this part. From the examination of the selected area, the main characteristics may be summarised as follows: the site is characterised by a spacious unused open area without any specific function. These areas do not belong to anyone and they become lifeless and difficult to maintain. The open space and its landscape main concept and the detailed landscape do not suit the residents' needs. The circulation system and the landscape applied there is not successful. Most footpaths, roads and parking areas are being used or underused in ways never intended. The landscape concept does not achieve privacy, safety, identity or human comfort nor does it confer any feeling of amenity.

Figs (5.12) and (5.13) show how the landscape design of the study area might be improved. The design is based on the idea of a ground floor tenants' garden as a means of providing a transitional zone between public and private spaces. It also offers the ground floor resident an opportunity of privacy, enclosure and to express individual identity to the public. At the same time, it gives each space of the site a practical function through increasing the private space at the

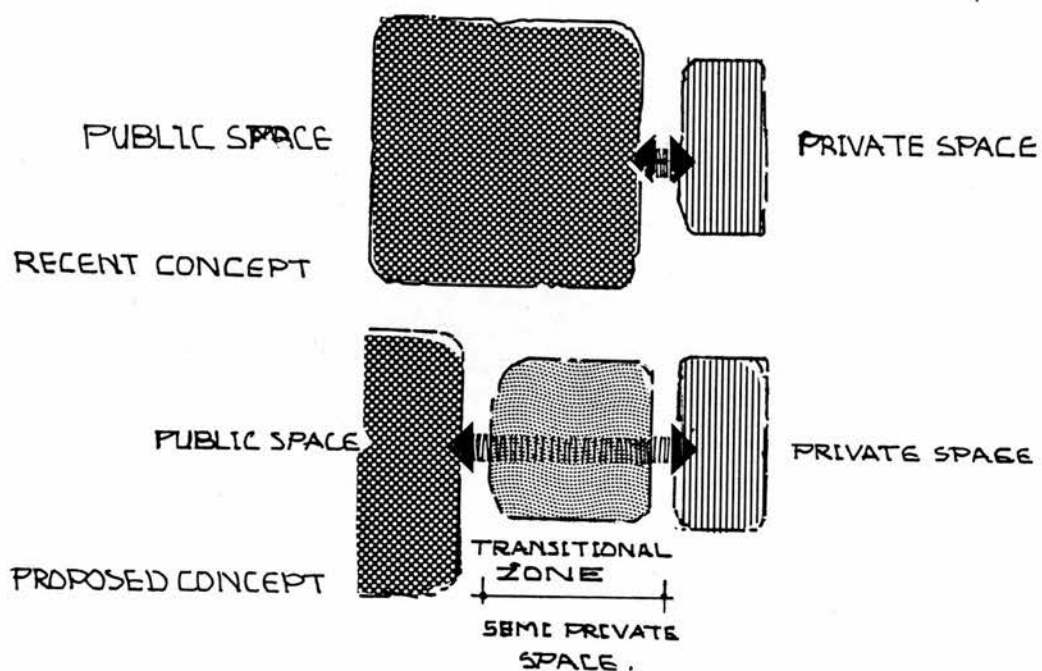


Fig (5.12) Shows the need for a transitional zone between the public and private spaces (sketch by the author).

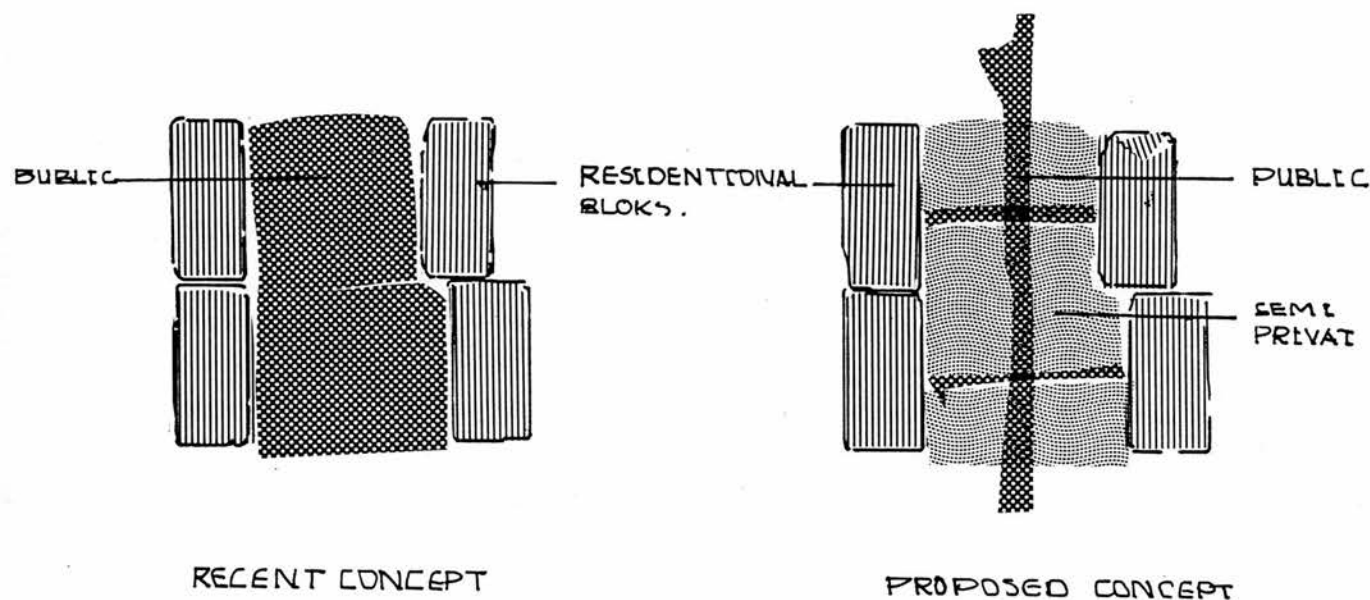


Fig (5.13) The proposed concept is aiming to increase the private space at the expense of public space (sketch by the author).

expense of public areas (Fig (5.13)). This it is felt will ensure a better social and physical expression of the space.

### The plan

Where the four-storey block of flats are arranged around an open court area the space between access sides could be partially fenced as semi-private gardens (tenant's gardens) which would be used and maintained by the residents (owner/occupier system) of the ground floor flats. Fig (5.14) illustrates some possibilities.

The concentration of semi-private open space in the area between the peripheral blocks is here complemented by the provision of public open space along an interlinking main footpath. The space left after the semi-private garden could be partly fenced as a semi-private and semi-public access leading to the main public access. These accesses (footpaths) will be narrow with irregular edges and well shaded with trees and shrubs reminiscent of the traditional hara pattern of space. The main footpath will be shifted from the centre of the inter-block space and run along the edges of the area parallel to the main street to the local centre with shops, comprehensive school and a mosque. Fig (5.15) shows the main plan idea. A combined system of footpaths and vehicular roads is proposed with measures to ensure complete safety for pedestrians. This concept will better suit the needs of the Egyptian who is used to walking through active streets swarming with life. The parking areas will be relocated and distributed around the site off the wide existing main street. A reduction in the width of the main street by provision of parking bays for visitors seems a good means of reducing traffic and a good use for unused space in the wide street (Fig (5.15) above). Some of the existing unused parking area could be replaced by sports facilities (football, swimming, basketball).

In the southern part of the selected site there is a large area



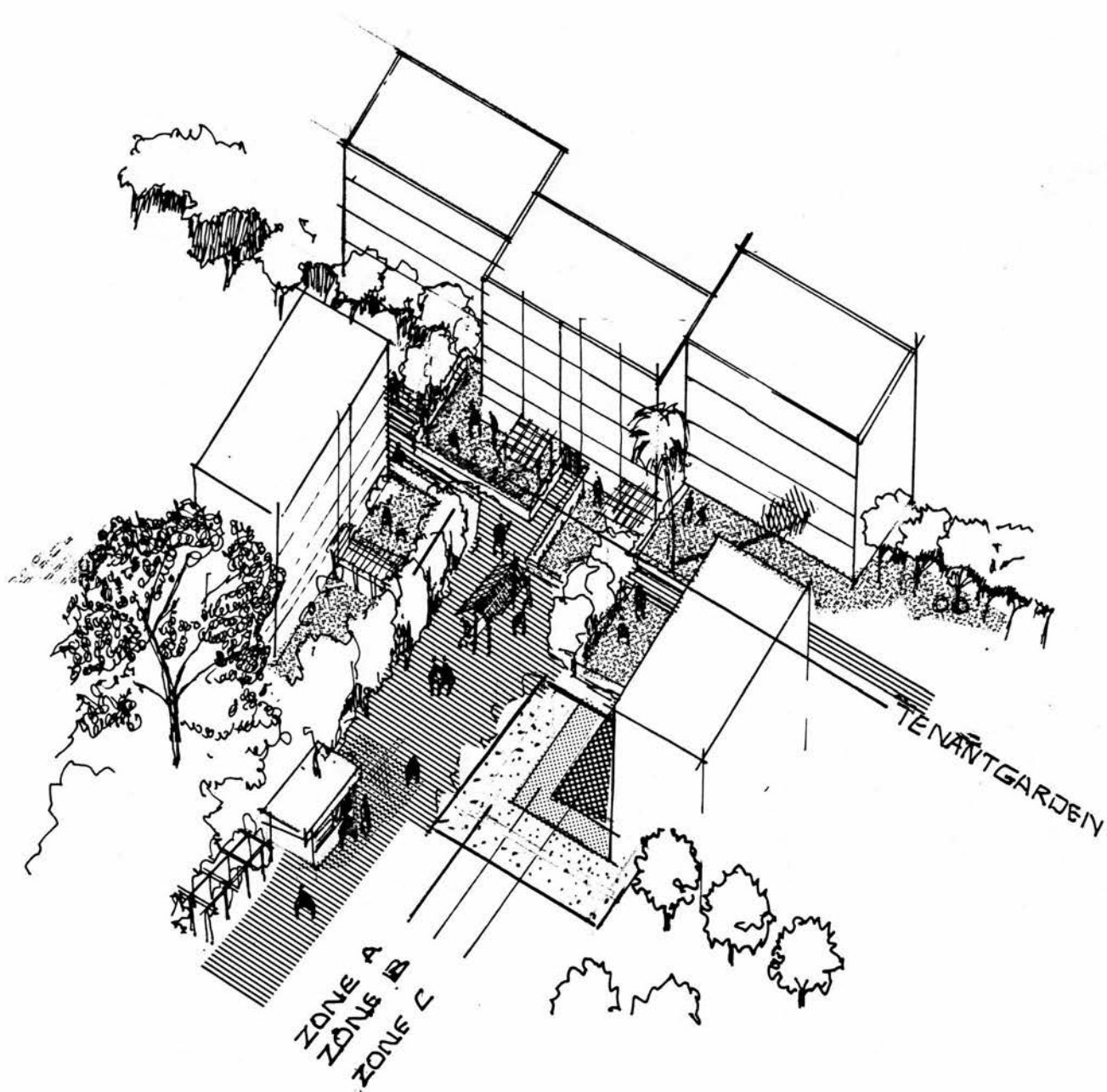


Fig (5.14) The proposed tenant garden with its zones (sketch by the author).

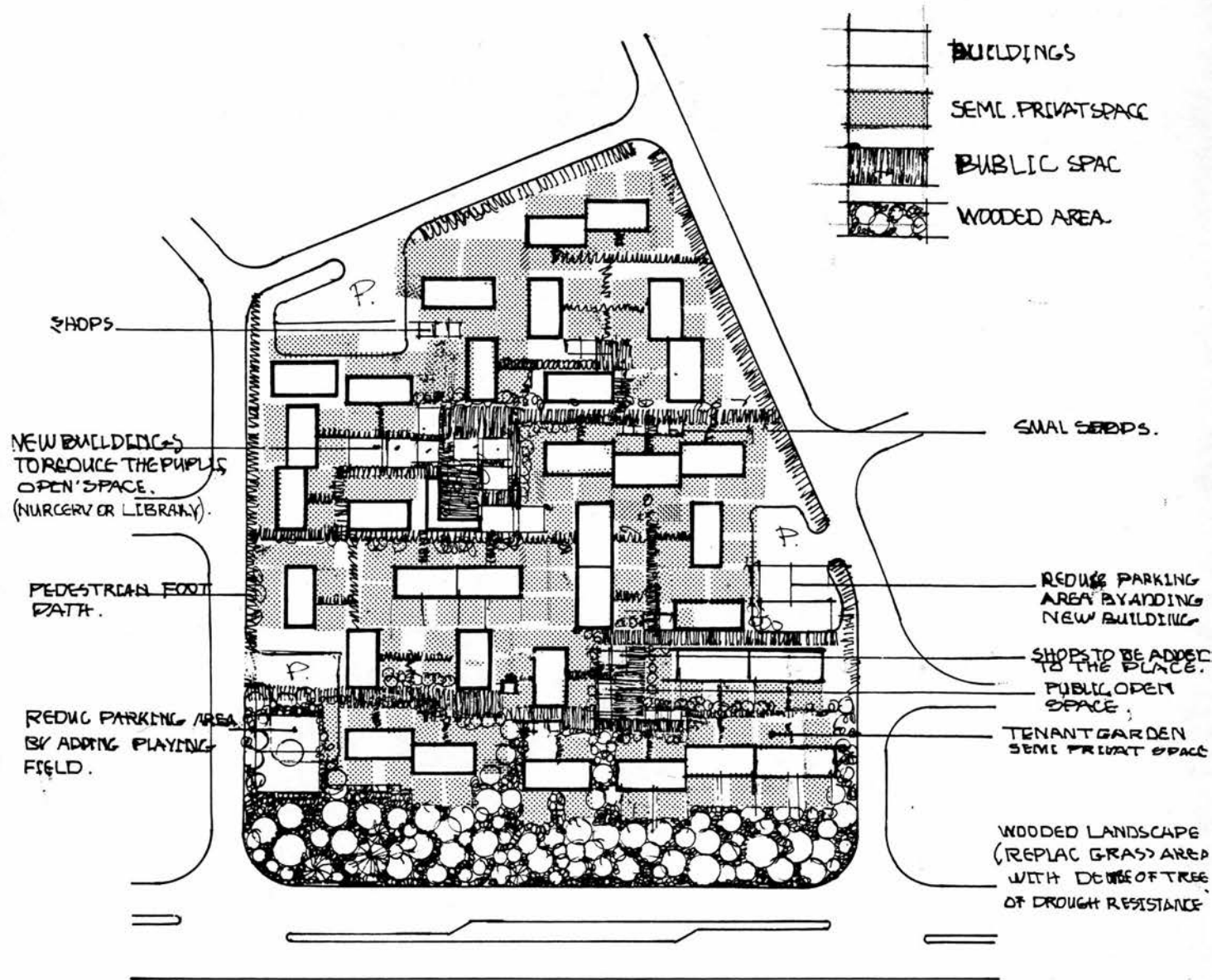


Fig (5.15) Overall new concept for the study site (sketch by the author).

beside the major road with poorly established grass and tree planting. This will be replaced by a wooded and wild shrub landscape concept with an earth modelling facing south to discourage free access to the major road and to protect the area from the hot dusty south wind (Fig (5.15) above).

The increasing of the private space at the expense of the public area will not only be by the "tenant garden concept" but also by a new use of ground floor flats. The inclusion of luncheon clubs, children's libraries or playgroups could transform the ground level garden and offer an opportunity to have a different character and scale of landscape. Fig (5.16) shows one example of covering the unusable space with a children's library. The project creates a visual opportunity for the residents around the area, by creating a green area which is maintained by the library. The space between the buildings was an area of dust and dry grass as in Fig (5.17).

In larger areas the surface could perhaps be utilized for a nursery with a light structure and a private patio to reduce the public area also. In some areas near the main public footpaths a partial change of use for the ground floor flats is also recommended in order to introduce compatible commercial uses reminiscent of the traditional harah system. In some areas, new blocks of flats could be added to the site or some of the existing blocks could be extended, keeping in mind the need for adequate light and ventilation.

The semi-private space and public space can be clearly understood by providing clear cut boundaries. A hedge of planting or high wall is one of the most successful elements of achieving physical and visual demarcation. In areas of high density the need to establish a strong boundary is of paramount importance especially with active Egyptian children. A combination of low brick retaining walls and light railings



Fig (5.16) A children's library has been built in unusable public open space, El Opour new district. It may not be the best example, but it shows how large poorly designated spaces may be redistributed. (photo by the author).



Fig (5.17)

Waste lands of public open spaces in the same district (El Opour), similar to that above on which the children's library has been built.

are an ideal solution. This fence is designed to allow fast growing climber plants to grow up to a height of 1.70 m when enclosure and privacy are needed.

Both the type and the location of plant material should follow points previously made in saving water, emphasising drought tolerance and speed of establishment. Fig (5.14) above shows the different zones for plant allocation.

The edges of the ground floor garden (Zone A) are often the most exposed to desert winds. The plants here will require many times more water than plants located in protected areas. This area is the boundary between the semi-private and public space, therefore it should be designed accordingly as a low maintenance area. Self-protecting arid area trees and shrubs are suitable here. One of the primary functions of such an area is to create shade for the public footpath and provide protection for the five-storey building against the desert wind and late afternoon sun. Zone A should be dominated by hard surface and be planted with the lowest water demanding plants.

Zone B could be cultivated with small trees or fruit trees, with small areas of hard surface combined with areas of desert ground cover for recreation. Again, drought tolerant species are best for this area.

Zone C is the most protected area from wind, sun and encroachment. The plant in this zone has more chance to survive. It could be used for growing vegetables and fruit as part of a productive landscape. This area could be maximized by increasing the vertical dimension in growing certain crops, by using stakes, fences or netting.

In general, the plant concept should function to improve urban desert climate and air quality, produce food and wood, encourage wildlife diversity and provide diversity of place and amenity. Drip irrigation might be of some use here but direct watering by the tenants



themselves would probably be more practical.

### **Summary**

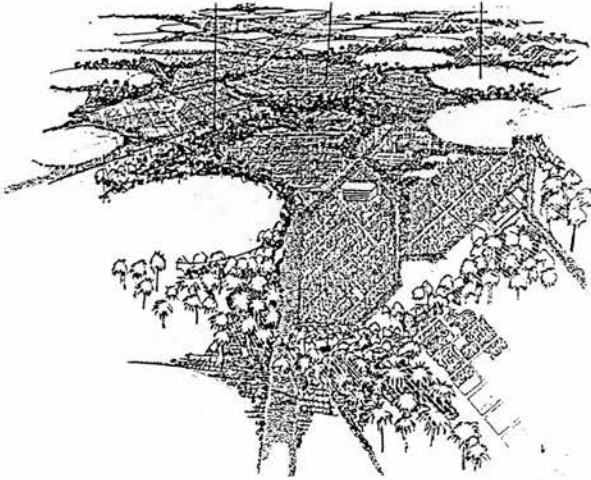
The proposed plan will achieve a maximum utilization and efficiency of the space by increasing the needed private space at the expense of the less used, wasted public space, to satisfy the tenants' needs. Within the site a hierarchy of space and movement will be provided. The large public open space will be divided into small gardens, the landscape of each is designed in a different manner, which helps to give some identity and feeling of belonging to those who live around them. When individuals take responsibility (as an owner/occupier system) for the ground floor garden the area left for public maintenance, and the burden on the public purse, will be reduced. Finally, the proposed concept benefits both the individual tenant and the general public.

### **Notes and references:-**

- [1] Walker, T., "Nightmare for Egypt's urban planner", Financial Times, 27/09,85, p3.
- [2] Shalabi, T., "Housing in Islamic cities", Arabic, Cairo, 1986, p216.
- [3] Hyland, A., ed. "Housing in Egypt", Univ. of Newcastle, p41.
- [4] Hough, M. "City form and natural process", Australia, 1984, p252.
- [5] Ibid, p252.
- [6] Lotsch, op.cit, p265. "In search of human measure", Garten & Landschaft, 1/84,

## PART IV

## CONCLUSION



## PART IV

### Chapter 6: Conclusion; proposed concept for an appropriate landscape for urban expansion in the Egyptian desert

The purpose of this conclusion is to focus upon an integrated interdisciplinary approach to the problems of landscape design of new urban areas in the Egyptian Desert.

As outlined in the opening chapter of this study the aim is not only to concentrate on the past and present errors of the E.N.T. and on the drawbacks in their landscape concept with a view to rectifying them (Part II and Part III), but also to propose a foundation for an appropriate landscape for urban expansion in the Egyptian desert. This final part of the study is a step in this direction.

Through Chapter 1, a background of Egypt's problems has shown that there is a great need for new town planning schemes to be established on unused desert land on the periphery of the Nile Valley rather than on the limited agricultural land within the Valley itself, to satisfy the essential needs of Egypt's growth. These new towns often try to attract people who are not native to the desert urban areas, and who must become acclimatized to the new conditions. Under these circumstances the environmental quality of a potential new town becomes very important. Consequently the idea of providing green landscape within the desert new towns may become essential to enhance a good environment. Unfortunately most of the E.N.T.s do not succeed in the implementation of this idea. Millions of pounds of investment in them have been wasted in planting swallowed by desert sand or scorched by saline soil.

Any study concerning the environment of new development which ignores the ecological integrity of the area of development is useless. Ecological integrity is the way all individual natural processes relate together on a site to produce overall stability. Consequently, this study has emphasised the importance of bringing urbanism and natural processes together, through careful site analysis (Chapter 2). A good understanding of the desert ecosystem and the ecological impact of development has shown that the regional factors which constitute and form the landscape of the Egyptian Desert may be considered as an opportunity for various land uses rather than being limitations to development - as they are commonly understood in the E.N.T. plans.

The foregoing discussions for the case study (Chapter 3) imply the need for a new landscape concept for the new settlements in the Egyptian desert. Planting in the desert should never be a matter of course; rather it should be done in a thoughtful, deliberate and carefully planned manner. The large left-over open spaces which must then be planted to alter the harsh desert environment, should never occur casually.

The major problem, however, does not lie only in the technique, implementation or the landscape concept itself but also, to a much larger extent, in the initial main planning concept (in particular its building mass and open space patterns), which, right from the start, fundamentally affect the subsequent landscape details. Much of the recent urban patterns of the E.N.T. are the product of imported concepts from non-arid regions. Unfortunately this imported concept does not address the needs of the people or the place. The approach to the problems should be to provide a suitable design for the site conditions rather than to modify the site to fit an imported alien concept like the E.N.T. As a result, more emphasis has been shown to be

necessary relating physical structure and social aspects to the traditional environment (Chapter 4 and 5).

Good design, whatever it is, will probably never be reduced to a formula, or become totally predictable [1]. It is important, nevertheless, to attempt to define some basic principles or at least guidelines which can be distilled from the discussion in the previous parts of the study.

This chapter briefly outlines the main principles that should characterise an appropriate planning concept for urban expansion in the Egyptian desert. Then the objective of the proposed landscape concept will be identified followed by an application of these principles and objectives in a proposed example of neighbourhoods in new desert urban areas. Finally, recommendations for further studies will be made.

#### 6.1 An appropriate landscape concept

Generally, the E.N.T. landscape design problems are interrelated, but through examination of the research, it may be found that the urban form, the open space pattern and the availability of green areas and their materials are the most critical factors that affect any landscape concept in new desert settlements. But first of all, choosing a proper site for an arid land settlement is the most important step in the process of ensuring an efficacious landscape concept. The success or failure of any landscape concept in desert areas depends chiefly on the physical characteristics of the site and its ecological opportunities that support a successful landscape. The different alternative locations should be carefully studied in relation to the preceding fact. Of all landscape factors, water and soil conditions (Chapter 2 above) may be considered as the most vital physical factors controlling the landscape in the Egyptian desert.

The unpredictable nature of precipitation in the Egyptian desert is



an obvious reason for avoiding the location of any new settlements where there is no adequate source of water for long periods. Within certain limits, the site selection for a new settlement should try to exploit the site's potential. For example, the areas around the existing open channels or wells built to provide water for newly reclaimed land may be an ideal site for new settlements.

Likewise, soil is a major determinant of existing and potential plant communities in the Egyptian desert. Despite the problems associated with desert soil, there are various desert areas of Egypt which have been considered for agricultural development.

The potential of the existing water and reclaimable soil available in the Egyptian desert necessitates, where possible, the selection of a site nearer to reclaimable land for new settlement plans. The land reclamation plan in Egypt, which has the same goal as the E.N.T. plan to develop unused desert land, should be associated with establishment of new settlements to provide conditions for their success. A good distribution of land use patterns and a good management of natural resources will lead to good planning for the E.N.T. policy.

The second critical factor is the urban form. There is no doubt that a compact high density planning form, with inward looking buildings with interior courtyards; and with narrow winding streets is the most appropriate planning form for urban expansion in the Egyptian desert. In extremely arid areas where vegetation is hard to grow and in the absence of controlled external space (as a result of the lack of a third dimension (e.g. hilly land form), the four walls of the buildings themselves and the compact form of the walled settlement are the only barriers against heat, dust and direct solar radiation. This is a basic defence against the extreme desert environment. This kind of compact form has a great effect on the physical and social environment. It has

shorter service runs which mean less cost for energy, construction and maintenance as well as less effect on the balance of the delicate desert ecosystem.

The compact form also reflects the process of morphological adaptation of desert organisms to the harsh desert environment. For example, many arid climate plants have massive sections with large volumes compared to their surface area. Similarly, the outstanding examples of the old traditional desert settlements with their compact form are the natural result of a long process of adaptation undergone by man through centuries to achieve the ideal habitat in a harsh desert environment (Fig (6.1)).

In order to get a successful application of the compact planning form to urban expansion in the Egyptian desert, it should be borne in mind that the size and shape of the old traditional compact settlement has a great influence on creating its admirable physical and social environment. The size of the old traditional settlement is small in comparison with the recent new towns due to the latter's transportation system.

To overcome these difficulties the size of the urban format of a new city should be in scale and adequately proportioned to allow the compact planning concept to be applied successfully. For example, the width of the urban mass should be proportioned correctly to allow cooler air to be drawn from the edge to the centre according to the urban heat island theory in hot areas, where the heat from the urban area builds up towards the centre of the urban mass and rises, thus drawing in the cooler air from the edges. If the width of the urban mass is too great, this means that the centre will draw hot air from the surrounding extended urban mass thus making the temperature much worse than the surrounding desert itself (Fig (6.2)).

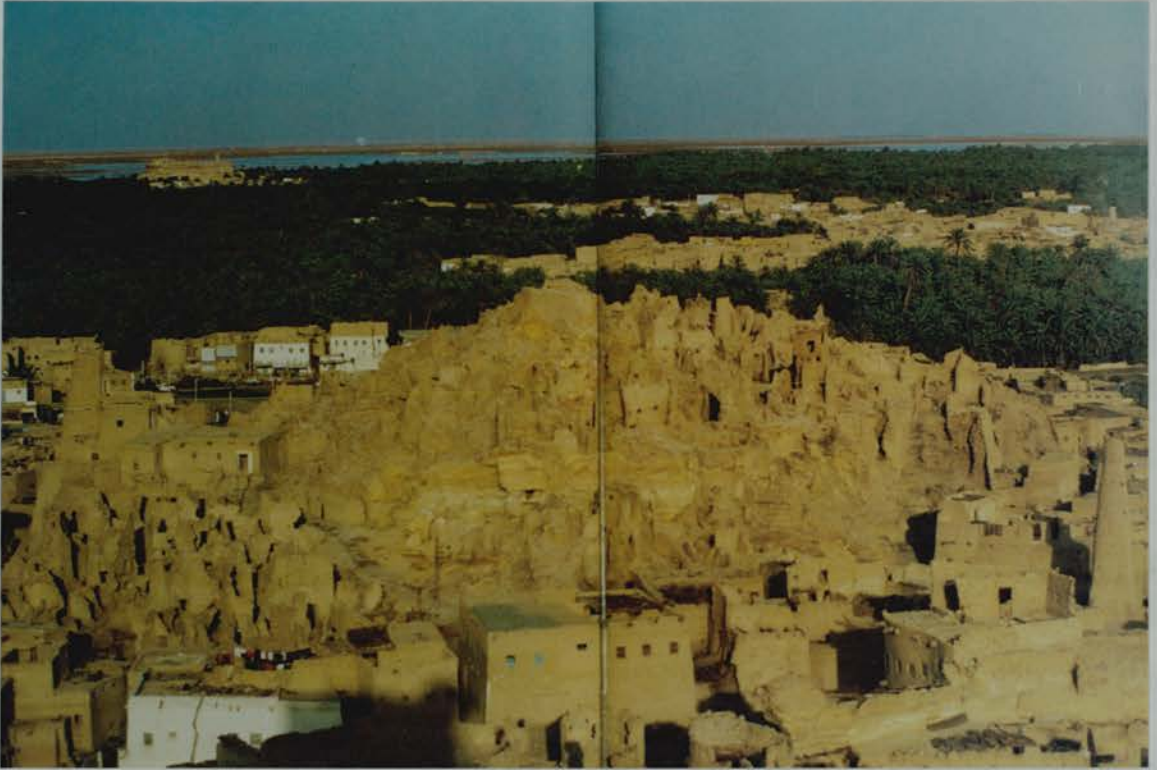


Fig (6.1) Shows the compact form of the old traditional settlement (Siwa Oasis). Egypt. The palm grove areas have integrated with the urban mass providing an ideal natural protection against the harsh desert environment. (Larsen, Siwa: Oasis Extraordinary, Aramco World vol. 39 No. 5, Sep.Oct. 1988, p6.)

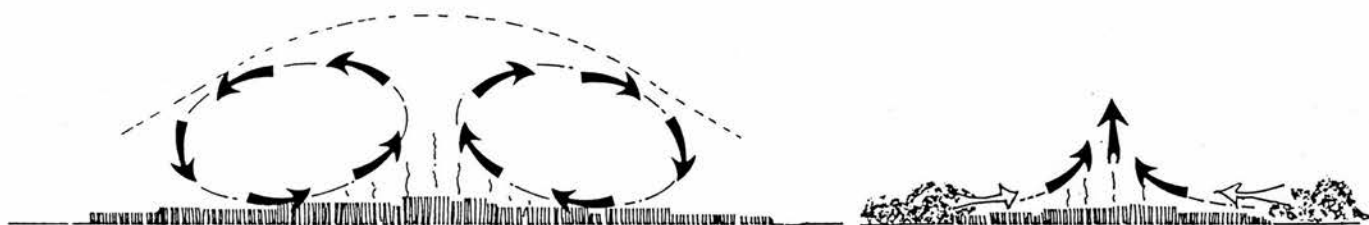
The right unit of urban mass may then be surrounded and integrated with a massive layer of plants to alter wind flow, improve air quality and reduce temperature, like the traditional settlement (Fig (6.1) above).

This unit could be conceived as a single section of the city, and as <sup>a</sup> whole it could be composed of a chain (linear, polycentric, radical or otherwise). Fig (6.3) shows some alternative forms of the urban mass adaptable to a wide range of cities. The compact urban unit with low buildings appears to be an ideal form to fit the plain desert which dominates the site for E.N.T. The buildings integrate into their sites by extending in a number of directions and form a protected space in between. These extensions of the form act visually like areas that reach out to hold onto encompassing parts of the site. It will provide desirable views in between the inward looking buildings to substitute for the lack of natural amenities in the surrounding desert area.

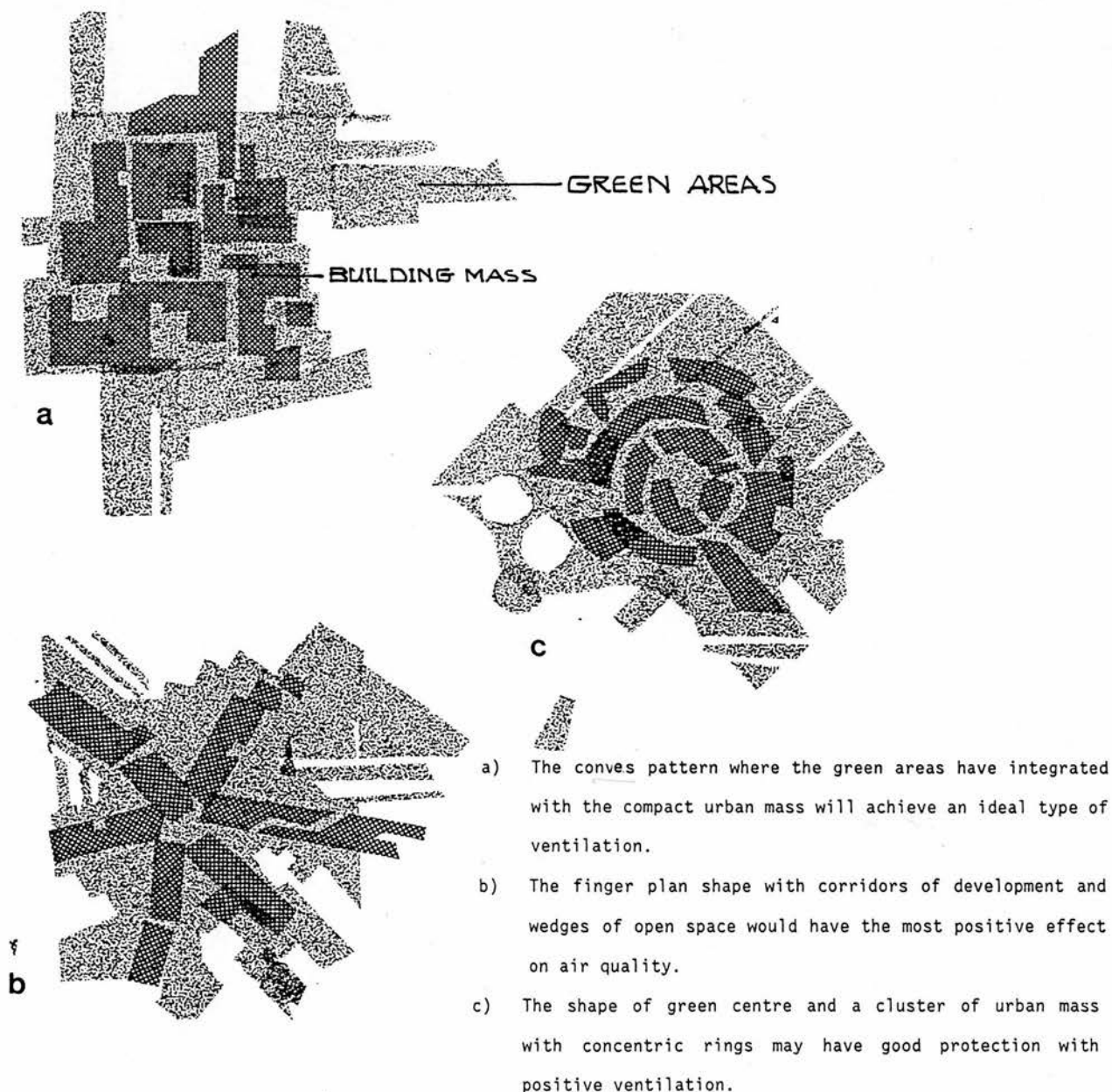
Moreover, the orientation of the compact urban form should be in respect to the climatic principle for the area. It should provide maximum shade, reduce glare and should be less subject to hot dusty wind and provide good ventilation. Although the orientation concept cannot be applied to the whole city (since various portions of the town will have non-parallel orientation), it is nevertheless possible to orientate most of the dwelling units to the best position.

Consideration of the location of open space is the third factor. Its pattern of distribution within the city, its size and positioning in relation to the adjacent land use and its detailed landscape design make up the third critical factor. This is not necessarily from its functional aspect, but rather from the stand point of the microclimate which it can generate.

The urban texture of fine mesh, of open space, distributed evenly



**Fig (6.2)** Shows the effect of heat island theory and urban mass in relation to its width; the large one will create a dome of hot air which affects the city climate by creating heat (sketch by the author).



**Fig (6.3)** Shows some alternative forms of the proposed urban mass; the urban mass will be integrated with the green area to form a well-coordinated environment. It may provide a compromise between traditional cities and the new requirements of modern life in terms of the design of a modern city.



over the whole settlement should be applied in the Egyptian desert. It offers the most successful example of climate manipulation in desert environments. It will provide and increase areas of shade and reduce the build up of solar radiation and glare. The small spaces will be less subjected to hot, dusty wind in summer and cold wind in winter. The same applies to street patterns; narrow and winding streets should be considered within residential areas and the requirement for wide roads for contemporary transport should be modified by sufficient tree planting spaces spread over the area. The main roads must be limited as much as practicable without causing undue inconvenience to service vehicles. Large open spaces which are required for specific purposes should be designed carefully and should have supplemental wind protection, both for the spaces themselves and the parts of the settlement beyond.

The compact urban form of small spaces has positively defined internal open spaces which are formed in hierarchy patterns within the close mass of buildings. These internal open spaces should be connected together and with the external open space by way of uncovered and covered pathways which create air circulation into and out of the building mass.

The availability of a green area and its material is the fourth factor. In hot, dry climates the importance of vegetation is a critical element in landscape design. It has a major effect on the maintenance of an equable microclimate within the urban form and is a great psychological relief for the residents. Planted areas will depend on water availability, soil quality, plant materials and the function of the area. Therefore, the first step in planting for landscape design in new urban developments in desert areas is to select the species for the site conditions rather than to modify the site to fit the species. From the ecological base of desert areas, the planting concept of new urban

areas should focus on native plants which require little water and can tolerate the desert environment. But this does not mean that non-native plants will be completely ignored from the plant list in desert settlements. There are a wide range of introduced species (non-native) which are successfully grown in desert areas (see Plant Index). They are characterised by heat, drought and salinity resistance. These plants should be kept in mind and developed and established in local nurseries in the same desert area where they are going to be cultivated.

However, the use of native (wild) plants in new urban desert development is not an easy task. The average Egyptian is far from conditioned to accepting such planting. As has been discussed before (Chapter 2, Cultural), Egypt consists only of wasteland and farmland (Fig (6.4)). There is no wild or semi-wild vegetation of any significance to the people - although there are in fact no truly wild areas. Accordingly, the Egyptian attitude towards wild desert plants is that these plants are still unacceptable. Their perception of landscape is always associated with productive agricultural landscape.

It is important to note, however, that the use of native plants does not eliminate the need for irrigation. Most of the wild plants grow in very low density communities in their original habitat. Thus, when used for their visual quality (higher concentrations) in an urban setting, they are typically irrigated beyond the level of mere desert survival. Any plant in an urban area will need extra supplies of water, although it is certainly true that the lower transpiration of native plants reduces the amount of irrigation needed.

The propagation of these native plants is also a problem to be considered, especially for mass production to satisfy the needs on a new town scale. For example, in the Riyadh Diplomatic Quarter, Saudi Arabia (a site which followed the wild plant concept) only 300 seedlings have



Fig (6.4) Egypt mainly consists of wasteland (badland) tableland in the distance and farmland (fertile land). The Nile Valley, Upper Egypt (photo by the author).

grown successfully out of 10000 propagated from seeds of some wild plants. Other indigenous plants had successfully grown on the same site. Even if native plants are propagated by the conventional nursery technique of establishment and development, the plants produced will be different in their characteristics from the ones which grow and propagate in the natural site, even if the nursery is on the same site.

Natural propagation in the site which is based on the natural succession of native plants could be successful. It should be noted, however, that the native plants will be developed as dynamic communities rather than having the unchanging composition of conventional gardens. At the same time, each desert plant community is generally dominated by one species which gives it visual uniformity. It has a number of species associated with it which may or may not be limited to any particular community type. Also, the ecosystems in arid and semi-arid lands are extremely fragile, their destruction being quick and easy and reconstruction slow and difficult. This system needs a clear study of the history of ecological degradation of the site in order to re-establish and develop the existing native plants.

One of the practical ways of using wild plants may be within the naturalised urban plant community. Such wild plants have grown and adapted to new urban conditions in new desert settlements without the assistance of man. They may become a valued resource for establishing vegetation on poor sites and sterile soils.

In general, the application of native (wild) plants should be made with care, and this calls for greater understanding of the ecological factors of both the plant and its relationship to site conditions. The selection of wild plants, however, cannot come from textbooks alone; it must be supported by prolonged field observations. This point is critical, especially in arid areas like Egypt where there is little

understanding and no practice of ecological principles.

The fifth factor which has a great affect on the landscape concept of the E.N.T. is the lack of landscape awareness, starting with the E.N.T. organisation but more fundamentally with the Egyptian people themselves and the attitudes given them in their education. As initial tasks, a landscape sub-organisation (a national and regional resource inventory based on Landsat) with broader concerns should be put in place within the E.N.T. general organisation. Its early task would be to amplify the current excellent monitoring process of landscape design of the E.N.T. as briefly discussed in the previous chapters (3.3 Landscape Process). It should be empowered to evaluate and integrate relevant comprehensive plans of the E.N.T., to supervise an information and study system and to prepare a guideline for landscape development projects. This sub-organisation could be privately set up at the beginning and handed over to the E.N.T. G.O. or to individuals in the future.

The second immediate task is to establish work-related training centres for the landscape industry. These centres will develop and operate vocational training courses to help overcome the chronic lack of competence in good landscape practice in Egypt.

The third task has to do with the professional landscape architect. In countries such as Egypt with its immense problems in the existing overcrowded urban areas located in the long stretch of the Nile Valley, where environmental and natural resources are endangered, the profession of landscape architect is a very important one. Unfortunately, there are only a very few such professionals in Egypt and there is no specialised landscape training in universities. An educational programme for landscape architecture should therefore be initiated as soon as possible within the universities. The Department of Architectural Science was established a century ago in Cairo University. It is time



that it diversified its interests.

Furthermore, environmental education in general and landscape education in particular should not be limited to universities and schools. There is no doubt that there is a great need of environmental awareness for Egyptians in different sectors. The recent efforts to create environmental awareness (if it is found) are just theoretical lessons and have limited effectiveness in practice. People learn best about life and their environment by constant and direct experience with their everyday surroundings. Programmes that involve interaction with and participation in the surrounding ecosystem should be encouraged.

The general Egyptian attitude towards arid land must be changed. This requires more information and involvement with the desert environment. The process of changing attitudes towards environment will be slow and may only be achieved through two or three generations but it must start without further delay. Religious organisations also can play a very active part in changing the Egyptian mentality and developing an understanding and respect for the environment.

### **Planning scale**

The landscape concept will be discussed in more detail in the following section on the neighbourhood level. Meanwhile, here, the landscape for the new desert settlement on the level of planning could be briefly described as shown in Fig (6.5). The compact urban form will be surrounded by and integrated with green areas where water is provided and soil is in favourable condition. These green areas could be in different forms; for example, a dense clump of native trees (palm) or the local nurseries for the new settlement could be placed between the urban mass, or it could be in the form of Bostan (Siwan gardens, Chapter 2 above) (similar to allotment gardens in Europe). The settlement as a whole will be surrounded by new reclaimed land which provides a natural

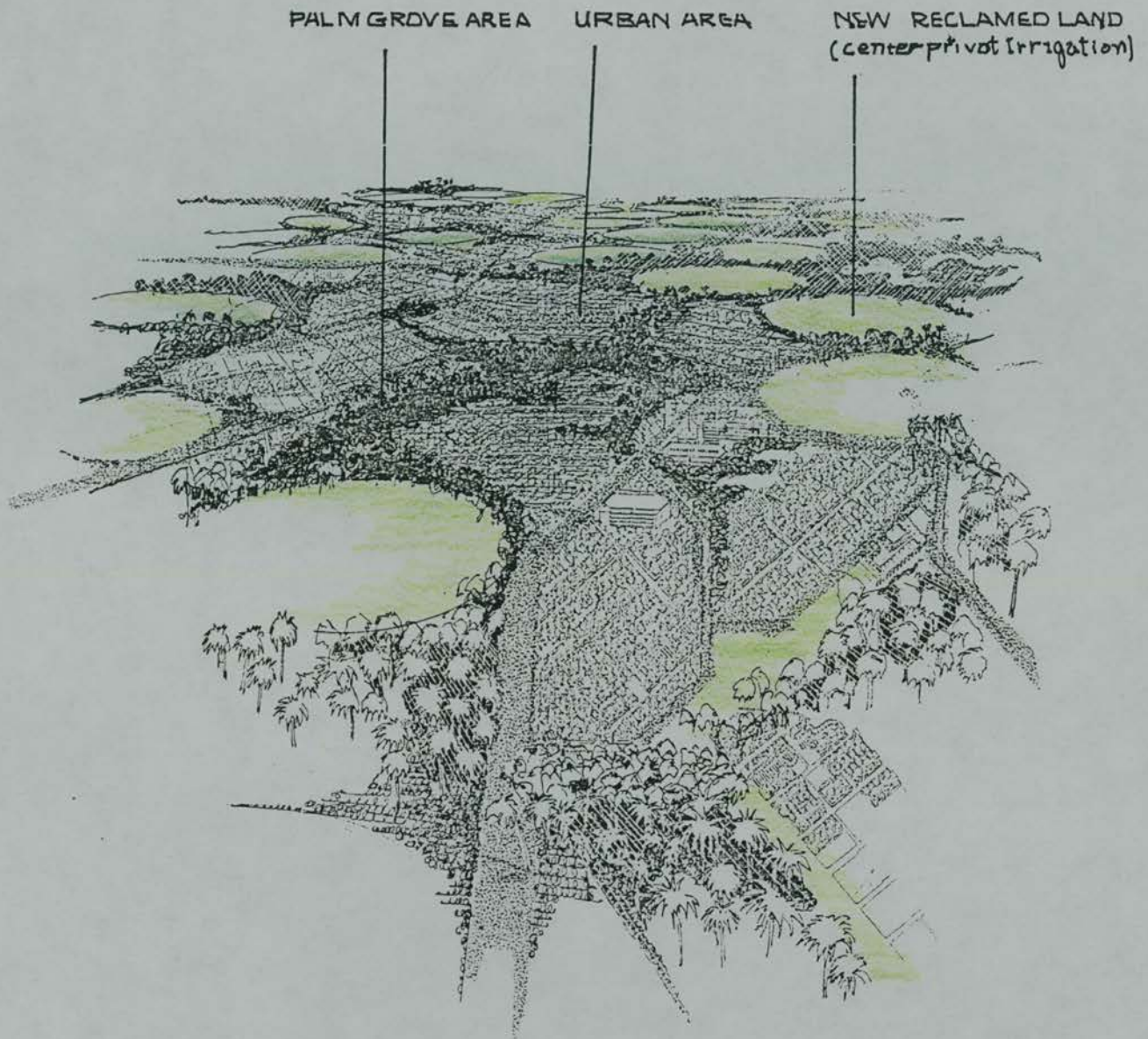


Fig (6.5) Shows the perspective of the proposed landscape planning concept. The integrated green areas (palm grove or Bostan garden or new reclaimed land) will provide protection against climate, heat, glare, wind force, dust, soil erosion and food for the residents. The land reclamation policy should be a common factor in the E.N.T. policy (sketch by the author).

protection for the whole settlement. It may be a series of green circles (centre pivot irrigation) surrounding the settlement as shown in Fig (6.5) above. In some desert areas (north of Egypt) natural vegetation could be developed and grown behind shelter from grazing animals and providing the natural protection to the new desert settlement and provide local character, often lacking in new urban desert developments. A mass of green area as suggested by previous ideas may seem a realistic approach for shelter belts in desert areas, unlike the two 25 m rows of trees of the E.N.T.s. Any large body of water found in or near to the site whether man-made open water channels for irrigation or a natural water course should be considered through the planning concept.

## **6.2 Objective of the proposed landscape concept**

A new approach to the landscape concept for urban expansion in the Egyptian desert is needed to ensure its survival. The use of plants in landscape design for these new urban areas in the desert could be a challenge which raises questions about the approach and objective of landscape design in desert areas. The fundamental objective of the proposed landscape concept for this study could be summarised as follows:

- Planting will be primarily employed to enhance the urban climate and then the visual environment. It must be recognized that plants, even when classed as ornamental, have some important functions in an urban context. They can modify the environment by providing shade and wind protection and they can perform other functions as well.
- The concept aims to bring planted areas back into productive use, using ecological management practices and an understanding both of human aspirations and of diverse natural and

cultural environments. At the same time it suits an agricultural nation like Egypt where the people associate exercise with work (cultivation) more than recreation.

- It aims to use a new design language which results from a clear understanding of the desert ecosystem and its natural process, keeping in mind the ecological determinants as the foundation of land planing in order that they may be reflected in the shape of the landscape following the principle that a desert should be treated as a desert. The recent landscapes of the E.N.T. have considered the natural process of desert sites as a problem to be engineered and corrected by replacing sandy soil with clay, uprooting native plants, introducing non-native ones, using huge quantities of water for irrigation and removing salt from the soil and adding fertiliser and changing the soil components. In some cases it has succeeded, but only temporarily and at very high cost, because in the long run, natural processes eventually eliminate the attempts at modification. The new proposed approach based on the natural process of desert sites is therefore the only realistic alternative to this alien approach.
- It aims to address the physical and social needs of the Egyptian. Any new development should take account of traditional attitudes. These are fundamental principles that shaped the old traditional urban form and are still valid to be rediscovered in any new development.

In general, the aim is to create a multi-functional landscape that suits the Egyptian environment.



### 6.3 Application

The research has endeavoured to implement these objectives through a proposed landscape concept for urban expansion in the Egyptian desert (neighbourhood scale). The proposed landscape concept will be presented through a division of the urban form into a hierarchy of multiple levels of linked open spaces and functions. This division takes its inspiration from what has been implied by this research. This could be summarised in two points. The first is that landscape design in the broadest sense deals with integrating people (social) and the outdoor environment (physical). In the outdoor arid environment, buildings and open space patterns as a means of modifying the microclimate raises the importance of these elements from the viewpoint of the physical aspect.

The second point is: from the analyses of the admirable system of division of space (four-fold) for the outdoor environment of the old traditional urban form (Chapter 4), it is found that it is valuable and viable because it is based on the actual needs and social structure of the residents. This gives the importance of the proposed divisions from the social viewpoint. Fig (6.6) shows the division of open space types which will be followed. Each type of space is distinguished by its different principles of design (especially its function) and its appropriate landscape concept whether hard or soft, conventional or natural, irrigated or desert, ornamental or productive. This will provide a framework for the planting composition and space definition by means of open and closed hierarchical landscape cells.

#### **Private open space**

The proposed concept aims to achieve a maximum utilization and efficiency of the open space in residential areas by increasing the

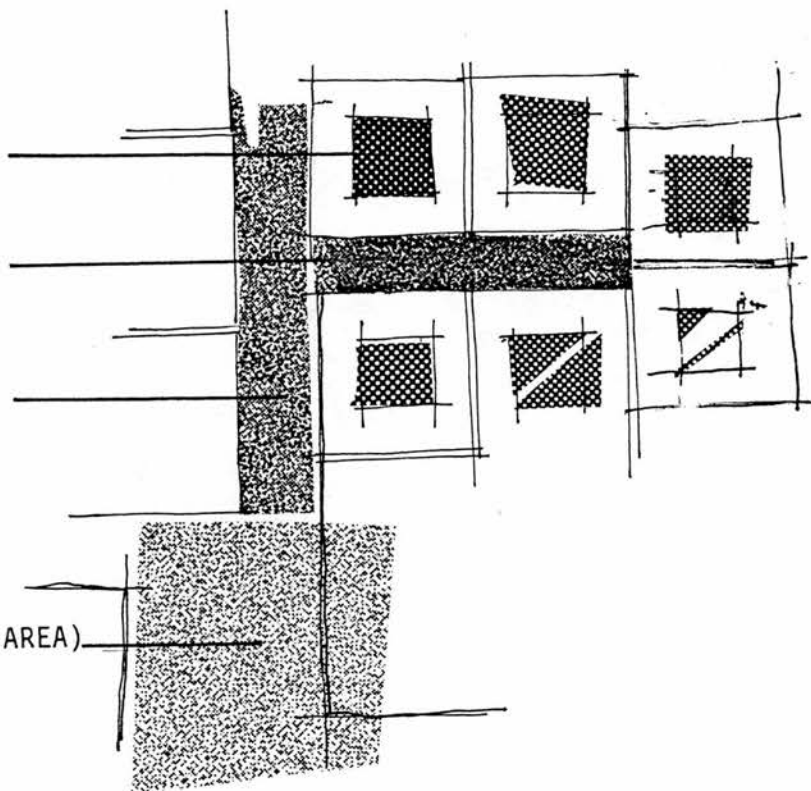


- PRIVATE (COURTYARD)

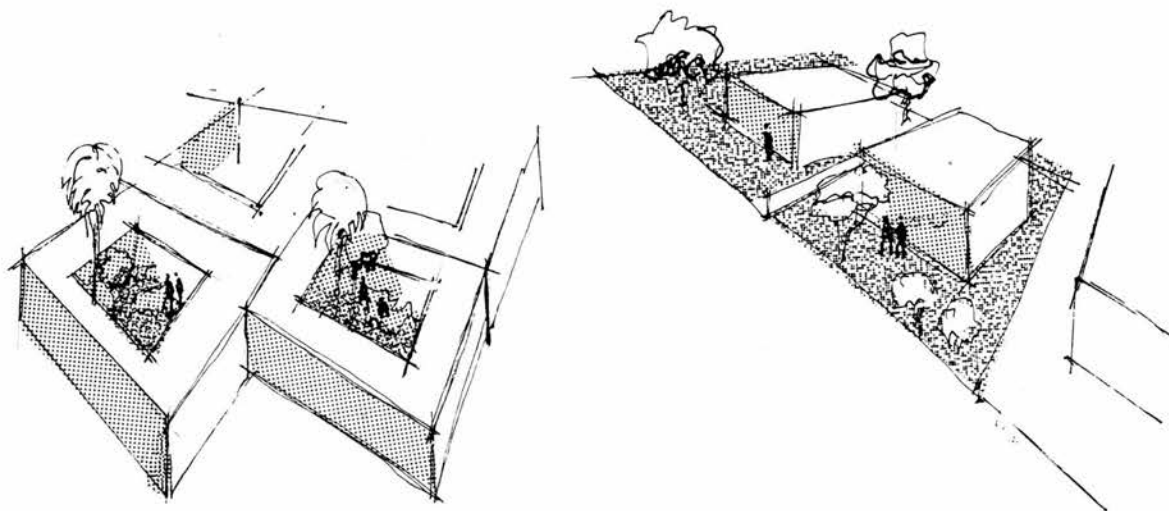
- SEMI-PRIVATE (DARB)

- SEMI-PUBLIC (HARA)

- PUBLIC (MIDAN AND OPEN AREA)



**Fig (6.6)** Shows the division of open space which will be followed in the presentation of the proposed landscape concept.



**Fig (6.7)** Shows the difference between the garden as a place and the building as a place.

needed private open space (i.e. courtyard garden) at the expense of the less used wasted public open space.

Therefore, the courtyard will be the first unit in the series of open space patterns in the proposed neighbourhood (Fig (6.6) above).

The courtyard which is perceived as a place in contrast to the E.N.T. perception of the building as a place (Fig (6.7)) is the most suitable form of space compatible with the Islamic family life style as being inward-looking or introvert. It provides the social and physical needs for the Egyptian.

The courtyard area will be occupied by hard and soft landscape elements that serve the residents' needs. An acceptable hard plan area should be provided for the daily needs (eating, sleeping, playing area for children). This area could be covered by tiles or soil, cement or small gravel. It should be located in the most usable area in the courtyard and should be shaded by trees or the structure of the building or light-structure landscape element, especially horizontal elements such as a pergola with climbing plants. In summer, the height of the sun in the sky makes it impossible to provide effective shade from a simple vertical form such as a wall.

The landscape cell for this area (courtyard) should contain three layers of vegetation. Trees will be planted at the open edge of the courtyard to provide shade and protection from the hot, dusty wind, also providing privacy when it is needed. Clear-stemmed trees with open, light foliage or narrow spread are generally suitable. Small fruit and blossom trees could be used in the second row or in between the tall trees. Care should be taken in growing large trees in courtyard areas; the size of the trees relative to the space available and rate of growth and root spread must be taken into account. The roots could cause

damage to the surrounding building. Shrubs and ground cover may form an integral part of the overall design in which trees, by virtue of size, are often considered to be a dominant feature (Fig (6.8)). Shrubs and ground cover contribute mainly to the well-being and comfort of the residents by creating an equable microclimate. Temperature reduction will come as a result of evapo-transpiration by the plants. They provide valuable habitats for wild life. The desert landscape concept could dominate the courtyard according to the scarcity of water. It will be possible to achieve very pleasing effects by the use of desert plants, rock formations and gravels and sand of various colours as ground surface textures. This concept could be a solution, but at present not a very realistic one in meeting the average Egyptian's expectations.

The courtyard as the most livable space for human beings and plants is considered a valuable resource which should be maximally utilised. The courtyard concept is the most appropriate food garden in desert areas from the physical and cultural viewpoint of the Egyptian. Productive plants should be the dominant plants in the courtyard area whether indigenous or introduced species. There is a wide range of fruit plants (native and non-native) successfully grown in desert areas [Plant Index]. These will help to provide a self-sustaining land use with considerable public benefit in both produce and amenity value. The potential of using irrigation techniques that conserve water (trickle or drip irrigation) and reused sewage water in a safe, healthy way makes the courtyard food garden quite feasible. Providing the right area for keeping small domestic animals is essential for the cultural needs of the Egyptian family. The courtyard could provide an ideal area to create educational links with the desert ecosystem in a practical demonstration on desert soil. Introducing wild life and plants from the

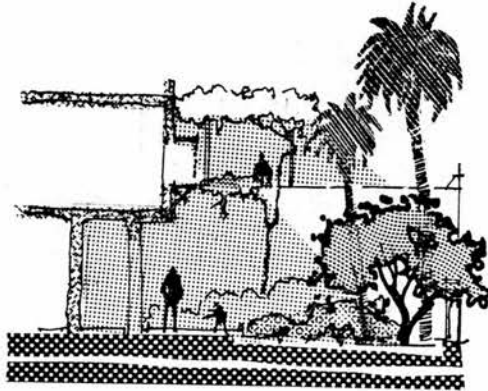
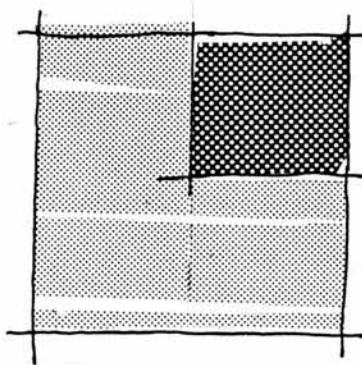
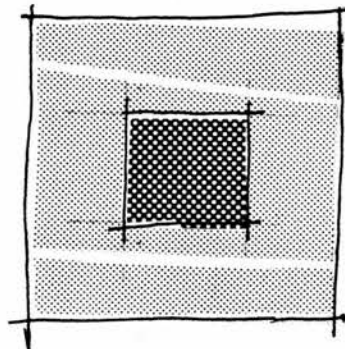


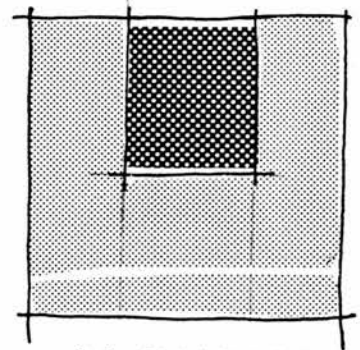
Fig (6.8) Planting concept for the courtyard area. A horizontal shaded element is needed to provide effective shade especially in the summer time as a result of the height of the sun (sketch by the author).



L SHAPE



CENTRAL SHAPE



U SHAPE

Fig (6.9) Different shapes of courtyard house (sketch by the author).

desert for children and adults should start in the courtyard garden. The place could be employed for growing food and designed for pleasure as well as utility.

The courtyard area is the most successful place for using water as a landscape element like the traditional Moorish garden. It provides a protection from dust and high rate of evaporation.

The courtyard house could be achieved in different shapes (Fig (6.9)). It could be one-storey or two-storey portions. Most Egyptian families extend the courtyard house from one storey to two when the family increases and funds are available. The courtyard house is the ideal form to fit the Egyptian attitude towards the extended family structure. The size and detailed design of the private courtyard depends on who lives there, what outdoor needs they have and what outdoor facilities are nearby. The individuals can efficiently plant their own garden which creates identity for each house and courtyard garden.

The open space within the boundaries of private ownership such as the courtyard garden will be maintained by the owner. This concept will solve one of the greatest problems of the desert new town open space. The concept suits the attitude of human beings towards open space, where they are only concerned with it if they feel that the area is part of their property, which means the providing of open green areas without the effort required to maintain them by the government.

#### **Semi-private open space**

The courtyard house could be developed in a cluster forming a contemporary residential environment in the new desert community in Egypt. It could be used to achieve a high urban density covering most of the land with low-rise buildings (two to three storeys). This may also allow increased control over the "urban climate" and help to create



an urban cold island.

The cluster form of courtyard houses in the old traditional settlement is a good model to be followed in the proposed concept. The space (Darb area) where the houses are grouped to form the first cluster units will be the second unit of series of open space in the proposed neighbourhood (Fig (6.6) above). The physical design of the layout of the Darb group of housing in the new development will be based on a detailed study of the needs of the residents and the theoretical standard of residential planning (safety and service). The houses will be arranged around the Darb area which will be kept to a minimum for the use of pedestrians only, mainly as a circulation area (Fig (6.10)). Vehicles will not be permitted to enter the Darb area except special cars and for safety purposes. The area will be like a residential street in modern terms. The Darb concept gives a greater measure of safety to young children moving about in the vicinity of their houses. The circulation system will give priority to the safety and convenience of pedestrians.

The parking area will be kept to a minimum according to the car ownership levels in Egypt (13/1000 per family) and will be located at the edge of the Darb group near the entrance to provide maximum supervision by the residents (Fig (6.10) above).

The Darb area could be considered as an intermediate area for transmission between private and public spaces, but it will provide some other facilities for this small group of houses. A play area is essential for children 5-12 years old. Toddlers will play in the courtyard under the supervision of their parents. A play area for children could be achieved within the Darb group by eliminating one or two units to provide a small community space for play, sitting or for gardens. Depending on its proposed use, the space could be located on the peri-

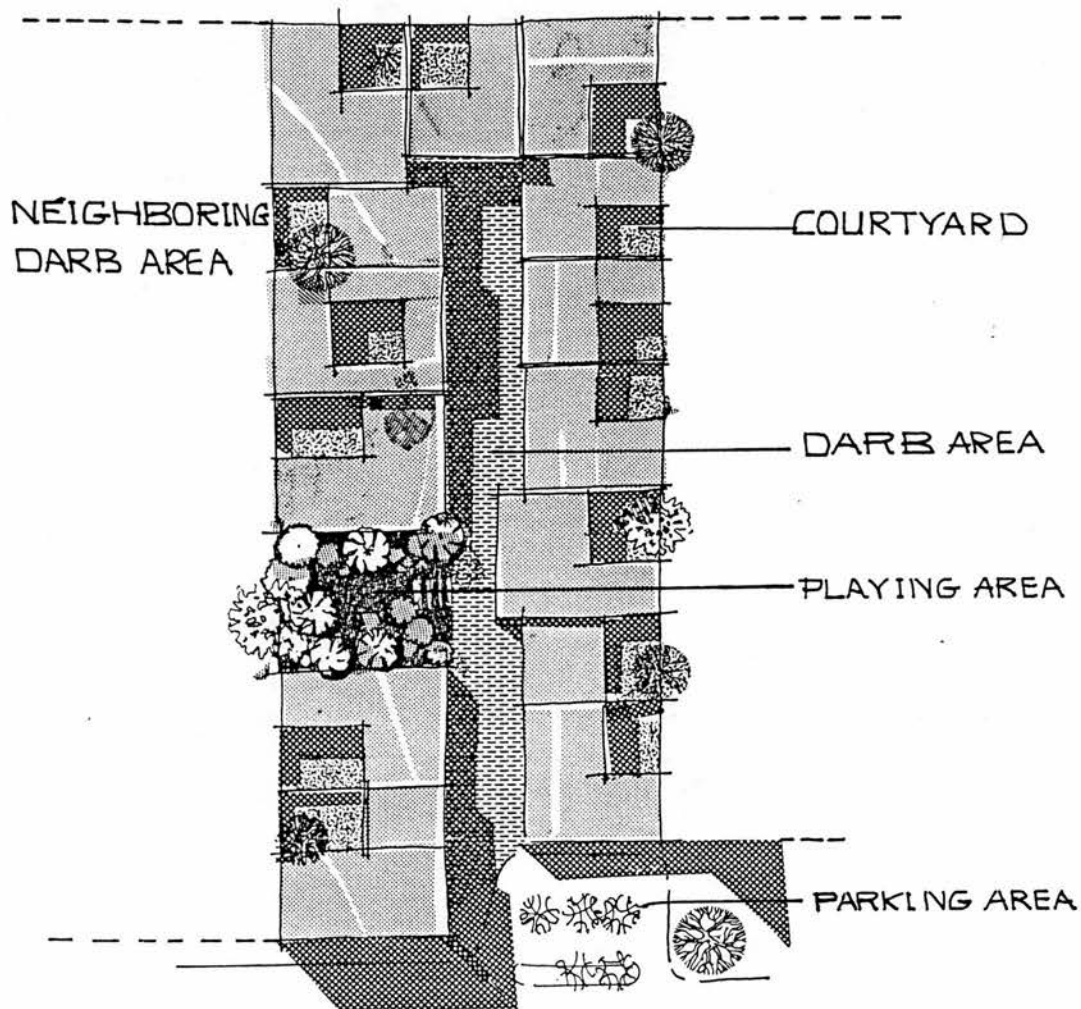


Fig (6.10) Plan of the proposed Darb group residential area (sketch by the author).

phery or in the middle of the residential group (Fig (6.10) above).

The system and the process of construction of the residential Darb group area in the proposed neighbourhood is important. A different size of land which has the same module pattern should be arranged around the Darb for a group of courtyard houses in different sizes (Fig (6.10) above). The idea used by Culpin and Ass, in the Ismailia Demonstration Project for the development of the core house is a good example to be followed in developing the Darb area. The land allocation of the houses and the infrastructure provision should recognise that this group of houses will be constructed and extended in different stages and there will be an intensification of use over time. This system recognises the way Egyptian areas traditionally developed with additional rooms and storeys being added to houses over time as family demands increased and as funds permitted [2]. Fig (6.11) shows the development process of the proposed Darb group. The Darb building could be one-storey or, in certain areas, two-storey portions could be added as long as they do not cause overshadowing or overlooking problems. Therefore, planning controls are needed to control and direct this process and, if necessary, to limit it. This concept will suit Egyptian extended family attitudes and achieve a density, whilst not being as high as recent traditional areas, high enough to keep the social ties. The Egyptian who lives in extended families and clans is more cheerful and gregarious and less inclined to violence than one who lives in isolated small families [3].

The landscape construction and the establishment of plants will follow the same process as that of the building. In the early stages of the development, some planting should start; buildings will provide protection against the desert wind and both plants and buildings will grow together. This system will suit the potential of using treated waste water for irrigation, the water supply increasing as the residen-

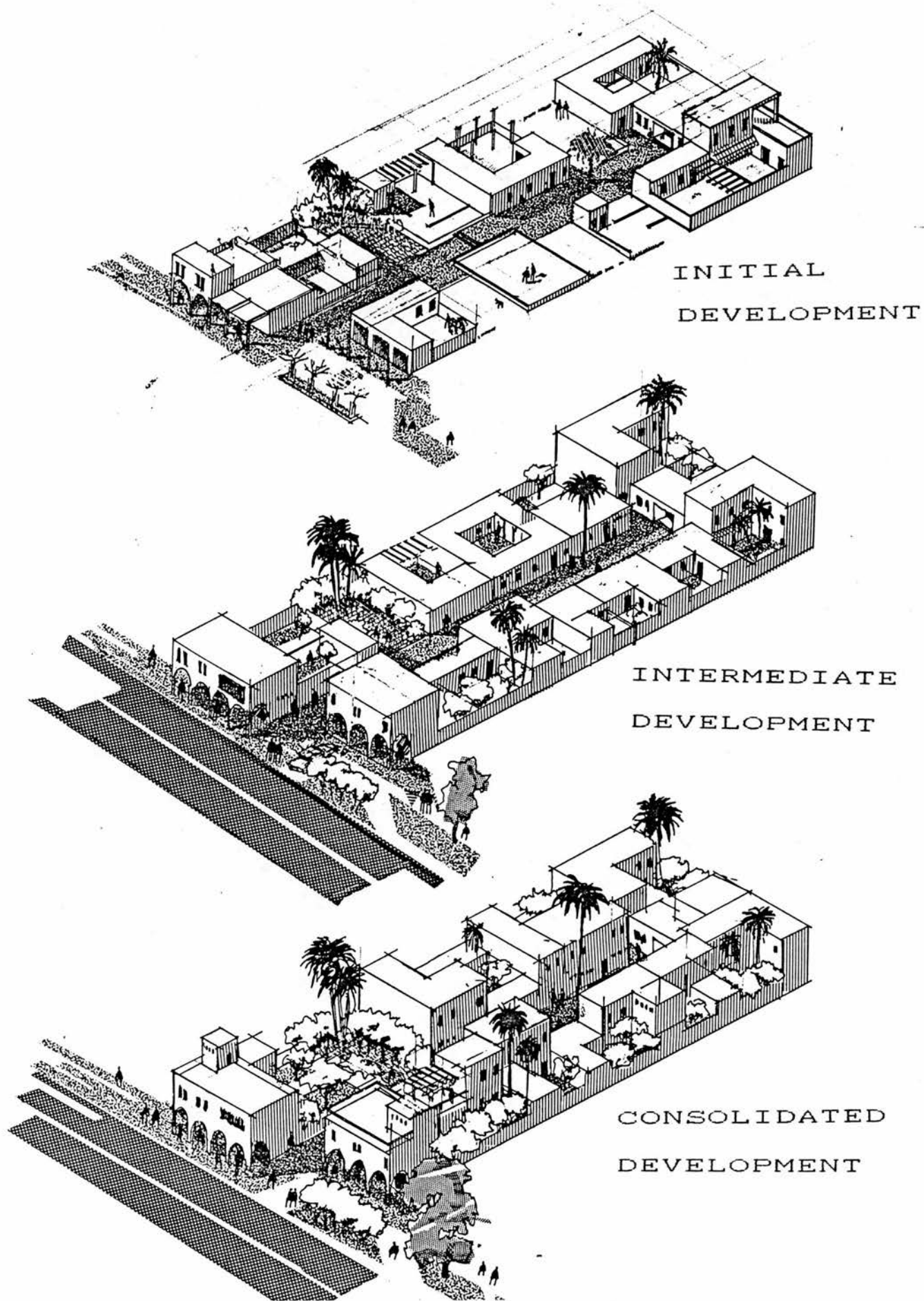


Fig (6.11) The development process of the proposed Darb group. These developments should be limited to heights of two to three storeys (sketch by the author).

tial area grows. Fig (1.13) Chapter 1 above shows a good example of the previous idea of developing the landscape in stages in a desert site.

This system will allow the users to participate to a large extent in the creation of their environment and the result will be a highly identifiable group of clusters which express the identity and available resources of the local inhabitants. These developments will be accomplished at a reasonable cost and efficiency of operation.

The buildings will be arranged close together around the Darb area which will be kept to a minimum to provide shade and minimize the impact of regional dust storms outdoors. The building form of the Darb group and spaces between the buildings (courtyards and Darb area) must be designed to take the greatest possible advantage of cooling breezes (Fig (6.12)).

The surroundings of the Darb area will be dominated by hard landscape except for some areas of soft landscape. The scarcity and high cost of water, the heavy use of the area by pedestrians which means high vandalism and damage to plants, the density of buildings and shade are all factors which will prohibit lavish ground level planting in the area.

A careful selection of materials, colour and texture for the Darb area buildings and group should be made to minimize conduction and convection heat gain. Paving with materials such as asphalt or concrete is a common (and obvious) solution but, just as obviously, it is not always an appropriate one. The use of soil, cement, gravel or rock mulch is an intermediate treatment between asphalt and vegetation that can serve effectively to stabilize disturbed soil and preserve the quality of natural conditions to some degree.

There is no doubt that there is a great need for plants in urban areas to introduce the shape, texture and colours of nature into the



manmade geometric patterns of open spaces and buildings. Providing green zones over the Darb area is not easy and if so it will be poorly planted and require more care to survive. Therefore, a better alternative to meet this need would be to have fewer, adequately planted zones, concentrated in specific areas rather than having more large zones spread all over the place and inadequately planted. It will be easier to maintain and protect a concentrated green area, especially from grazing animals and vandalism by children, than to maintain and protect a more spread out one. The playing area within the Darb group is the ideal place to accommodate this concentrated green zone (Fig (6.10) above).

The area should be a comfortable space for rest and recreation. It will contain play facilities for children (i.e. swings and slides) as well as comfortable benches for the elderly and adults supervising the children. The whole area will be covered with a dense mass of trees, which will provide a desirable microclimate for the users. This wooded landscape concept will stabilize the soil, absorb solar radiation and reduce the effect of the hot, dusty wind. There are a good number of large, salinity and drought resistant shade trees which have already been planted successfully in the Egyptian desert at a minimum cost and requiring minimal water consumption and maintenance (Chapter 3). Ground cover consisting of desert plant material (shrubs and ground cover) will be integrated with trees on the edge of playing areas to define the areas and sand will be provided for the playing areas. There must be freedom of movement and play for children and adults. The wooded landscape in its natural form will create a diversity of wildlife and a creative play environment and amenity. This concept with its natural form will cost less in terms of maintenance and upkeep. The playing area will be surrounded by buildings (three sides), which will provide protection against the desert environment (hot, dusty desert wind); it

will be like a large courtyard garden with dense tree planting within the building mass of the Darb group residential area (Fig (6.10) above). A combination of wall and railing fence should be established on the side that opens to the Darb area to stop grazing animals entering the playing area. Also a paving grid and gates could be used to stop goats far from the planting area, or following cars outside the Darb.

The parking area on the edge of the Darb group can also provide a useful space within the urban framework in which to plant trees. Shade trees in groups should be planted where possible, to provide an adequate shade.

The productive plants (trees or shrubs) will be eliminated completely from the landscape of the Darb area. They can become a source of embarrassment in the future because of young people climbing the trees to pick fruit or from the mess caused by fruit lying rotting on the ground. Fruit trees need to be protected from excessive public access. The approach for a productive landscape should be applied in areas where it is easily managed and maintained.

The maintenance (cleaning) of the hard landscape will be the responsibility of the residents. Each resident will clean in front of his house in accordance with the Egyptian attitude in traditional areas, where the semi-private space is small and easily maintained. The play area will be maintained by the municipality of the area.

#### **Semi-public open space**

The residential group of courtyard houses (Darb group) could be planned as components and groups of components, that fit into larger scale planning of the proposed neighbourhood and the new communities (Fig (6.13)).

The open spaces of the Darb areas will lead into one main street which will play the same role as the Hara space in the old traditional

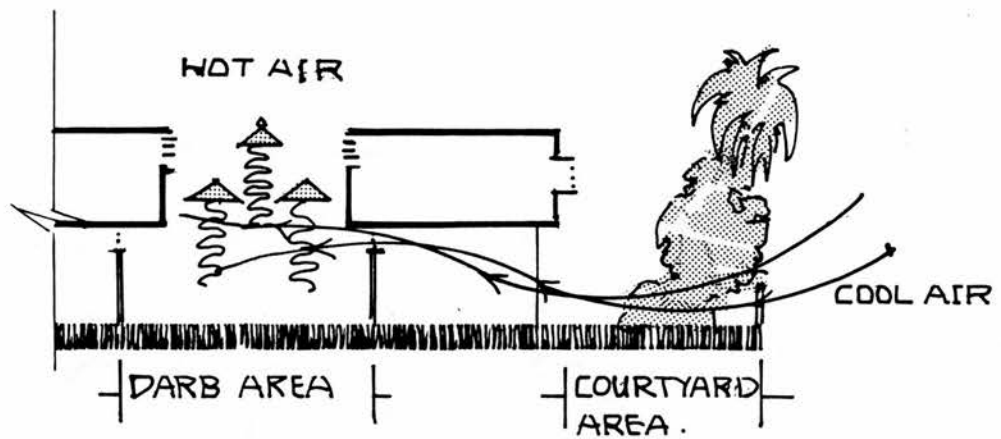


Fig (6.12) Cross-section through the Darb area. Since the Darb area is larger and thus less shaded than the courtyard, air heats up more readily there than in the courtyard, the heated air rising in the Darb area draws cool air creating a cool draft through the house.

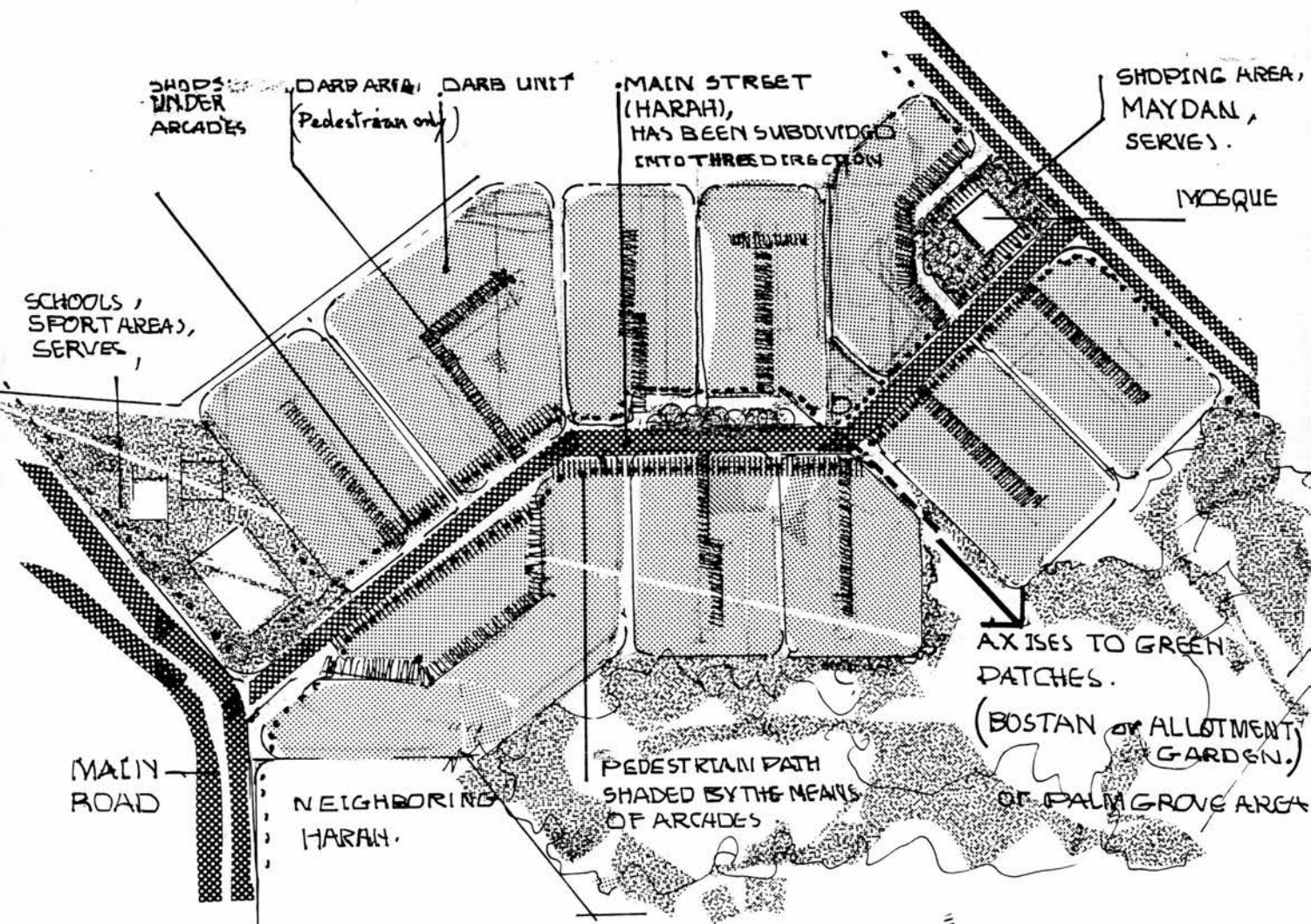


Fig (6.13) Plan of the proposed Harah area (neighbourhood) (sketch by the author).

urban form (Chapter 4 above). This will be the third unit in the series of open space patterns in this proposed concept (Fig (6.6) above). The proposed neighbourhood will be smaller and more compact than the recent E.N.T. neighbourhood. It will place emphasis upon the development of low-rise medium density cluster environments that optimise the inter-relationship between the Egyptian desert environment and the urban form which reflects the actual needs of its users. It should be noted that locating the Darb group units on the site of the neighbourhood should be undertaken after circulation and open space are understood for the whole development, then all three systems (open space, building and circulation) can be integrated and manipulated together.

The Harah (main street) will accommodate the circulation system which should consist of footpaths, cycle paths and vehicle roads. The main street (Harah) will be subdivided into sections of direction (Fig (6.13) above), each one having its individual identity. These sections of direction will slow down the traffic speed and ensure safety for cyclists and pedestrians. At the same time, the system should achieve efficiency of circulation, especially for vehicles. The proposed concept tends to make all activities accessible and reduces total trip distances, which increases the potential for short walking and cycling trips. At the same time, these facilities should be served indirectly by the vehicular system.

Pedestrian paths should be designed for human use and for safe pedestrian use. From the physical design criteria for pedestrian routes in desert areas, it must be possible for the pedestrian to walk in shade for at least 80 m of every 100 m of the route between the hours of 0900-1100 and 1400-1700 in August [4]. Here, the structural systems of the buildings around the Harah space will be utilized to provide shade and protection by means of arcades, columns and galleries. Shade trees will

be used in areas where it is difficult to provide shade by using the building structure. The footpath will be combined with the vehicular road in one space but with clear separation; most of the footpath will be under the arcades. The system will create an active and lively space for pedestrians and the occupants of vehicles, which promotes social interaction for residents and suits the Egyptian behaviour in circulation areas. Some small shops could be located under the arcades to provide the ordinary needs of every-day life for the residents of the main street (Harah) and surrounding Darb areas.

The proposed concept with its more human scale will increase face to face relationships, social contacts and solidarity which are strongly needed in our contemporary urban space.

The landscape of the Harah area will be dominated by hard landscape due to the same obstacles which shaped the Darb area, but the Hara will be more heavily used than the Darb area which means that the area of hard surface will be larger in the Harah. Some areas within the Harah space will be occupied by conventional static landscape where there is land available for green areas. Some types of urban landscape need this kind of static landscape form. It could be in the form of a row of trees, individual trees or a combination of ground cover, trees and a few areas of shrubs planted in raised beds. Because of the unfavourable conditions in street areas, the plant species selected must be able to tolerate air pollution and dry conditions. Individual palm trees (Hyphaene thebaica (Doum) or Phoenix dacylifera (Date), which have these special characteristics, are the most suitable specimens and can be used for ornamental purposes as well as for providing shade. It could be the dominant tree running through the whole community linking the various open spaces of the urban form and spreading out of the city to surround the urban mass in dense natural palm groves to provide a protection



against the desert environment similar to the traditional urban form (Fig (6.1) above). In general, the planted area within the Harah should be kept to a minimum and placed where it is essentially needed.

Moreover, there should be a certain amount of green mass to soften the visual impact of the building mass in the Hara area. This type of green mass could be achieved by placing some of the courtyard gardens of the surrounding houses on the Hara space (Fig (1.13) above, Chapter 1). The lush green mass of the courtyard will add desirable visual impact to the space of the Hara as a whole and create a space identity (Fig (6.14)). This green mass, which benefits the public, will be protected by courtyard buildings and maintained by the owner of the house with some help from the city municipality which ensures its survival. A fence with a dense screen of trees is an essential need to maintain privacy and help to reduce noise. Each Harah will get its own identity which means enormous variation between the neighbourhoods of the whole development.

### **Public open space**

Fully public open space is the last unit in the series of open space patterns in this proposed concept (Fig (6.6) above). Large scale public green space concept is not recognized in the old traditional urban form. Even if found on a slightly larger scale, it was traditionally surrounded by walls to keep out the surrounding desert with its dust-laden winds and to give privacy and protection. But in modern planning, one of the principal objectives of open space in the neighbourhood should be to provide residents, both adults and children, with adequate opportunities for outdoor recreation and serve in their own areas as an urban park, sports area and a central area for shopping.

The shopping areas are found in the traditional urban form, but in a different shape. Most commercial and vending activities occur in the

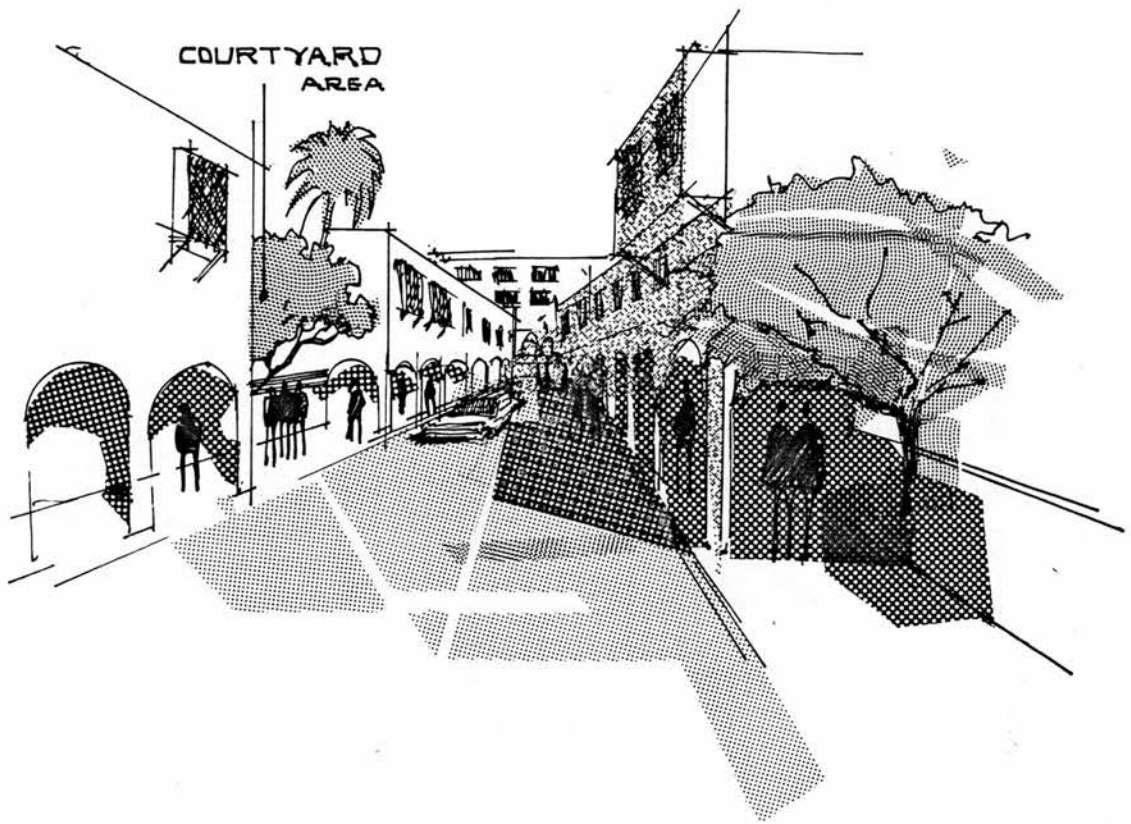


Fig (6.14) Achieving desirable visual impact to the space of Hara by placing the courtyard on the space (sketch by the author)

| CHARACTER-<br>ISTIC<br>SPACE       | HARD | SOFT | CONVENTIONAL | NATURAL | IRRIGATED | DESERT | NON-<br>PRODUCTIVE | PRODUCTIVE |
|------------------------------------|------|------|--------------|---------|-----------|--------|--------------------|------------|
| PRIVATE<br>(COURTYARD)             | ○    | ●    |              | ●       | ◐         | ◐      | ○                  | ●          |
| SEMI-PRIVATE<br>(DARB)             | ●    | ○    | ○            | ◐       |           | ●      | ●                  |            |
| SEMI-PUBLIC<br>(HARA)              | ●    | ○    | ○            | ◐       |           | ●      | ●                  |            |
| PUBLIC<br>(MIDAN AND<br>OPEN AREA) | ◐    | ◐    | ○            | ●       |           | ●      | ○                  | ●          |

Table (6.1) Shows the main characteristics of the proposed landscape concept through its four-fold division of space.

Dominant

Equitable

subordinate

non-existent

main street or square (Midan) near the mosque. This is the most important place where personal participation in community life takes place. In the proposed concept, the Hara street will lead always to the Midan area (Fig 6.13 above) where most of the shopping area and services are found according to the real needs of the residents of the area. This area will be dominated by hard landscape surface with dense shade trees. Heavy shade should be provided by trees; ground cover of desert plant material will be found in raised beds instead of a grass area when it is needed. Shrubs will be integrated with ground cover to define space. Not only the size of the Midan is important, but also its detailed design. There should be tree-shaded oases surrounded by arcade buildings. Most of the buildings for shopping should be oriented inwards and shaded like the traditional covered commercial streets, the original idea of the atrium space. Fountains might be placed in enclosed spaces (courtyard - atrium). The idea of a fountain in an open desert area would on the other hand be quite unrealistic.

The term "urban park" does not exist in the vocabulary of traditional Egyptian cities either physically or culturally. The concept of park in the traditional sense is something of an anomaly in arid regions. In most of the E.N.T. the park concept does not succeed because it does not address the ecological needs of the Egyptian desert and the social needs of the Egyptians. The western idea of an urban park should be eliminated from the fabric of the Egyptian urban settlements. Instead, the well landscaped courtyard garden and playing areas will satisfy the need for recreation areas to a certain degree. The other alternative is by providing access for the resident to the nearest large green area surrounding the urban form. As discussed earlier, the urban mass will be compact and integrated with the surrounding green area in a reasonable scale (Fig (6.5) above) that will allow the resident to reach

these areas on foot (200-300 m). Most of the users will have a reasonable measure of privacy as a result of the extensive nature of the areas. This suits the Egyptian family when they need to spend a day out in an open area enjoying their day in privacy without being disturbed as a result of unbounded open space. These green patches between the urban mass could be equipped with the needed recreation facilities for a day out. This large green area could be achieved by different means as has been discussed earlier in this chapter. It could be located between the neighbourhoods (Fig (6.13) above) or at the edge of the settlement (Fig (6.5) above) not too far from the residents. It could be in the form of green fields, Bostan (allotment garden), nursery area or areas of wild vegetation. Water courses (arroyas) or man-made open water channels for land reclamation could be utilized as waterfront areas for recreation, which adds more value to the site.

Outdoor sport is a new activity in Egypt but there is every sign that it will become as popular as in the west. Football is already a very popular sport around Egyptian cities and in the countryside. Hard surfaces are very commonly used for informal small football pitches, but grass or synthetic grass will be needed for the main ones. Also, some areas of hard outdoor playing surface are needed for some sports which are starting to gain popularity, like tennis, basketball and volleyball. These areas should be located on the periphery of the neighbourhood and should be protected and enclosed by belts of trees or walls and covered, if possible, by large scale open tents to provide shade for players and spectators. The multipurpose open space concept should be applied in the new settlement through the day. For example, a playground for schools could be used by the students in the morning and by the community in the evening. There is no need for open spaces that are used only for a short time through the day. These multipurpose areas and sports

grounds must be adequately lighted for evening use as nighttime is always the most favourable for sporting activities in hot areas. Some sporting areas will need to be designed specifically for women taking into account their need for privacy. In general, quantity, location, detailed design and management of public open space and any related facilities must be designed according to the overall housing density and social character of the residents. For the planting scheme, however, it could be said that the native desert plants (trees, shrubs, ground cover) should dominate the area and the highly irrigated plants should be eliminated completely except for some areas (i.e. grass) for specific sports sites if it is needed. Ephemeral material should be used effectively within a disciplined framework of the urban landscape. There is sufficient rain, especially in the peripheral desert of the Nile Delta, to support ephemeral and woody shrubs. The conservation of rain water by means of catchment areas to collect water for irrigation will allow the native desert vegetation to grow and flourish and provide stabilization of the desert soil and allow wildlife to flourish.

The productive landscape will occupy a great part of the area and will be supported by the potential of using sewage water, treated to ensure health and safety, from the residential area (Chapter 3 above). Desert fruit trees should be cultivated in controlled open areas (inaccessible to the public, i.e. industrial areas). The whole process of cultivation could be managed and maintained under the supervision of the organization which owns or controls the land for little or no cost and perhaps some benefits.

The main characteristics of the proposed landscape concept (at neighbourhood level) maybe summarised in Table (6.1).

#### 6.4 Further studies

Preceding parts have concluded and addressed the problems and set



forth an appropriate landscape concept for urban expansion in the Egyptian Desert.

A number of further studies are required to enhance knowledge about the landscape prior to any further new development in desert areas. These studies may cover a wide range of topics and they may need immediate action because they precede other important actions which could fundamentally affect the new developments. Some of these studies can be carried out by Egyptian institutions such as the study relating to the Egyptian environment. Others may have to be undertaken by foreigners, especially in the field of management.

A study of the water resources available to this nation should be made for long-term projections (200-300 years). The spreading activities (urban, agricultural and industrial development) on desert land demands huge quantities of water. The clear fact emerges that, if water is limited in quantity, any new development should realistically consider this. Necessity is a powerful agent for change.

Appropriate environmental criteria need to be established and adjusted to the specific conditions of the desert areas. The environment and the landscape of desert areas are completely different from those of the Nile Valley and the Delta. Guidelines including ecological data for each environmental zone of the Egyptian desert is essentially needed. This part of the research should be directed towards universities.

Lack of management or poor management is the common feature of most administrative organisations of the E.N.T. Management and monitoring process studies are fundamentally needed for the Egyptian organisations.

Meanwhile, there is no single, simple sweeping generalised answer to the problems in any area. Rather, each area has its own particular environmental characteristics and these must be known and understood in

detail before there can be any man-made, long-lasting solution to such problems.

The pilot studies which deal with the landscape problem in desert areas are realistic approaches to get a clear guide for new developments. The immediacy of these pilot projects is that they precede essential long-term programmes. The E.N.T. plan cannot move ahead until fruitful results are returned by pilot projects.

For example, the application of native (wild) plants in new urban desert areas (as has been proposed in the previous chapters) should be considered through one of these pilot projects. These native plants should be tried out in selected sites in the Egyptian desert on a pilot basis to determine their practical usefulness.

The tenant garden concept which has been proposed to improve the existing situation of the recent E.N.T. might also be piloted for wider application on other E.N.T. sites. The pilot should be carried out in such a way which allows community representatives to take the lead in the design process, and so that most residents are able to participate.

And in conclusion all of the lessons learnt from the projects should be considered and developed in a much closer and more fruitful dialogue between the professions of landscape architecture, architecture and planning, and within the time-honoured and too easily forgotten traditions of Egypt's Islamic culture.

#### Notes and references:

- [1] Greene G., "Landscape and cityscape design in arid regions" (ed. G. Golany), "Urban planning for arid zones", Canada, 1978, p200.
- [2] Lötsch, B., "In search of human scale", Gartent Landschaft, 6/84, p22.
- [3] Davidson, F., "Ismailia, from master plan to implementation", Third World Planning Review No. 2, May 1981, p173.
- [4] Reda, H., "Yanbu Industrial City", Saudi Arabia, 1981, p20.

## APPENDICES

## APPENDIX: A

### Plant index

The index of plants is classified as follows:

Part I (trees, palm, shrubs, climbers, succulents, ground cover), plants commonly used in landscape design in Egypt.

Part II (fruit trees which have been used for new reclaimed desert areas).

Part III (indigenous shrubs and ground cover which have been collected by the author) (see Chapter 2 Plants).

Column references are as follows:

Name Botanical/common name/local

|                           |                                   |
|---------------------------|-----------------------------------|
| D/E                       | Deciduous or evergreen            |
| Texture                   | F/M/B, Fine, Medium, Bold texture |
| Saline, drought tolerance | F/G/E, Fair, Good, Excellent      |
| Wind resistance           | F/G/E, Fair, Good, Excellent      |
| Growing                   | R/M/S, Rapid, Medium, Slow        |
| Propagation               | S/C, Seed or Cutting              |

Major sources are as follows:-

- Cochrane, T., "Landscape Design for the Middle East", London, 1978.
- Van-Ollenbach, A., "Planting Guide to the Middle East", USA, 1978.
- El-Hadidi, "Street Trees in Egypt", Cairo Univ., 1st 1968, 2nd 1979.
- Cejka, J., "Trees and shrubs for landscape use in Jordan and Neighbouring Countries", W. Germany, 1982.
- Täckholm, V., "Students' Flora of Egypt", Cairo Univ., 2 Ed. (1974).
- Duffield, M., "Plants for Dry Climates" Tucson, ZA, 1981.

This section describes the most common widely used plants in landscape design in Egypt. These plants are listed in alphabetical order to their botanical names. The following tabled cultural guide with each plant description illustrates the plant's basic characteristics. These tables could be considered as a brief guide to be used in the landscape design of the region. These plants are classified in three parts:

#### Part 1

##### a) Trees including palms (p438-458)

This includes large trees of forest scale and medium shade and decorative trees. The most common palm trees in the region are also illustrated. There are a good number of these trees which could be successfully grown in desert areas.

##### b) Shrubs and climbers (p458-468)

This section includes multi-stemmed and decorative trees and flowering and foliage climbers. It should be noted that a great number of these common widely-known shrubs have a low drought tolerance and require some quantity of water and may not be the most appropriate for desert sites. This emphasises the importance of desert shrubs (indigenous plants).

#### Part 2

##### Fruit trees (p471-473)


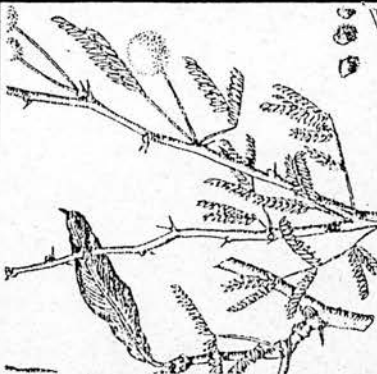




Most of the plants in this section have been successfully grown in newly reclaimed desert in Egypt (i.e. Mudriaet Al Tahrir, Chapter 1) brought into cultivation.

#### Part 3

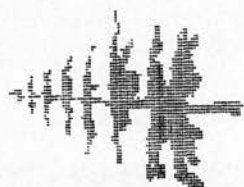
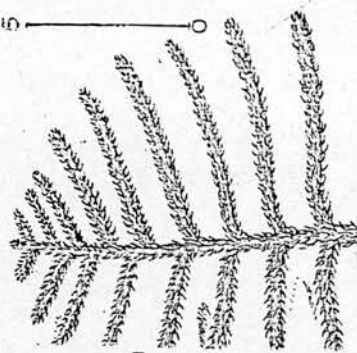
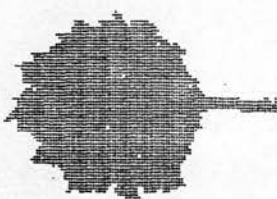


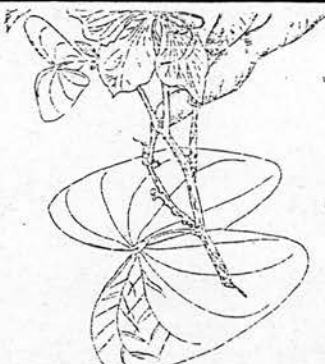
##### Indigenous shrubs and ground cover (p474-477)

The plants in this section are typical of indigenous plants in the Egyptian desert which could be considered suitable for the various requirements of landscape design. There are some thousands of Egyptian native species of which several hundred are useful in landscape design and include the 12 detailed here which have been collected by the author.



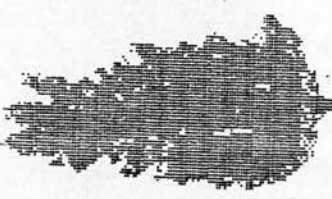


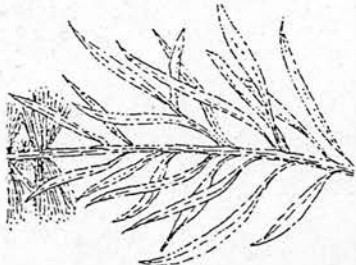


| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |                               |                     | MATURE HABIT         |                 |         |                  |   | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|-------------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--------|
|  |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD   | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| ACACIA<br>FARNESIANA<br>SWEET<br>ACACIA<br>FUTNA       |    | D                       | G      | G      | DARK GREEN       | fl      | BRIGHT YELLOW<br>EARLY SPRING | M                   | M                    | M               | M       | S                |    |        |
| ACACIA<br>NILOTICA<br>NILE<br>ACACIA<br>SANT           |    | D                       | SO     | BO     | BLUE GREEN       | fl      | BRIGHT YELLOW<br>LATE SPRING  | G                   | G                    | M               |         | SO               |   |        |
| ALBIZIA<br>LEBBEK<br>LEBBEK TREE<br>DHAKNEL -<br>BASHA |  | D                       | SI     | O      | DARK GREEN       | M       | GREENISH YELLOW<br>SPRING     | G                   | F                    | G               | R       | SO               |  |        |



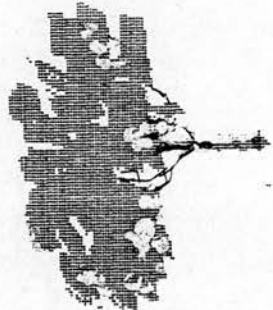


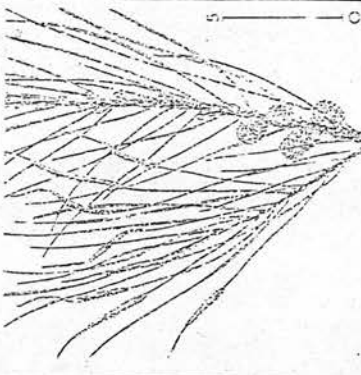
TREES Major source of illustration (drawing) El-Aadidi, Cejka, Van Ollenbach and the author

| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |                             |                    | MATURE HABIT        |                 |         |                  |   |  | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|------------------|---|--|--------|
|  |   | DECID.<br>OF<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |  |        |
| ARALUCARIA<br>EXCELSA<br>NORFOLK<br>ISLAND PINE<br>ABU-KARIA |    | E                       | 30     | 10     | BLUE GREEN       | M       | —                           | G                  | F                   | G               | S       | S                |    |  |        |
| AZADIRACHTIA<br>INDICA<br>NEEM<br>NEEM                       |    | D                       | 20     | 20     | BLUE GREEN       | M       | GREENISH WHITE<br>SPRING    | G                  | 7                   | 7               | M       | S                |    |  |        |
| BAUHINIA<br>VARIEGATA<br>ORCHID<br>TREE<br>KHOF-EL-<br>GAMAL |  | D                       | 4      | 5      | LIGHT GREEN      | M       | YELLOW WHITE<br>LATE WINTER | 7                  | 7                   | 7               | M       | S                |  |  |        |


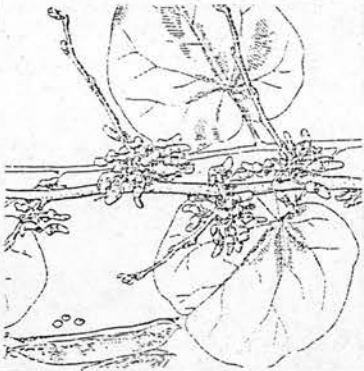
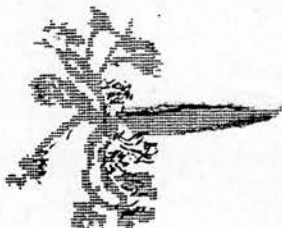

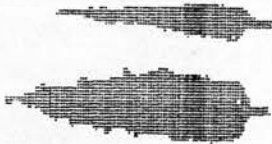
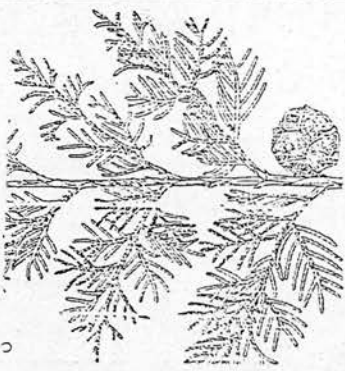
TREES

| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                  |   | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--------|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| BOMBAX<br>MALABARICUM<br>SILK COTTON<br>TREE<br>BOMBAX          |    | D                       | 35     | 15     | DG<br>DARK GREEN | B       | RED<br>EARLY SPRING         | T                   | T                    | T               | M       | S                |    |        |
| BRACHYCHITON<br>POPULNEUM<br>BOTTLE TREE<br>BOUDRET<br>EL-AFRIT |    | M                       | 20     | 8      | BLUE GREEN       | M       |                             | T                   | T                    | G               | M       | S                |   |        |
| CALLISTEMON<br>LANCEOLATUS<br>BOTTLE<br>BRUSH                   |  | M                       | 20     | 5      | BLUE GREEN       | T       | BLACK RED<br>EARLY SUMMER   | T                   | T                    | G               | S       | S                |  |        |

TREES


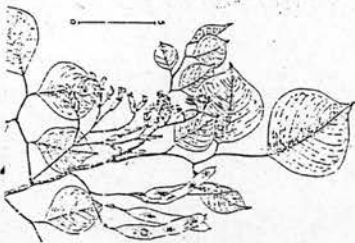

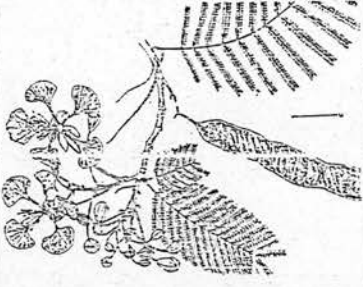


| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |                             | MATURE HABIT        |                      |                 |         |                   | DETAIL  |
|--|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|-------------------|---|
|  |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |
| CASSIA<br>FISTULA<br>GOLDED<br>FLOWER<br>KHAR<br>SHAMBAR   |    | D                       | 10     | 6      | DEEP GREEN       | M       | YELLOW<br>EARLY SUMMER      | D                   | F                    | D               | S       | S                 |    |
| CASSIA<br>NODOSA<br>PINK & WHITE<br>FLOWER                 |    | D                       | 10     | 10     | DEEP GREEN       | M       | PINK. LATE<br>EARLY SUMMER  | D                   | F                    | D               | S       | S                 |   |
| CAESALPINA<br>JUNGHANI<br>AUSTRALIAN<br>PINE<br>CAESALPINA |  | E                       | 35     | 7      | BLUSH GREEN      | F       |                             | M                   | S                    | M               | R       | S                 |  |



| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |   |                     | MATURE HABIT         |                 |         |                  |   | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|---|---------------------|----------------------|-----------------|---------|------------------|---|--------|
|  |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD               | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| CERCIS<br>SILIGUATUM<br>JUDAS TREE<br><br>CERCIS         |    | D                       | 8      | 6      | GREEN            |         | RED - SPRING                              | F                   | F                    | F               | F       | S                |    |        |
| CHORISCA<br>CRISPIFLORA<br>VEGETABLE<br>SILK TREE        |    | D                       | 20     | 7      | BLUE GREEN       | B       | YELLOW - SPRING<br>PINK - WHITE<br>SPRING | F                   | F                    | F               | S       | S                |   |        |
| CYPRIPEDUP<br>SEMIFRIVENS<br>ITALIAN<br>CYPRIPES<br>SAZU |  | E                       | 30     | 3      | BLUE GREEN       | F       | YELLOW - SPRING                           | U                   | U                    | U               | F       | S                |  |        |


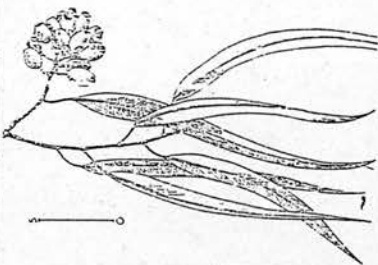

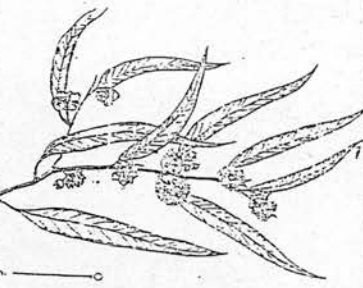

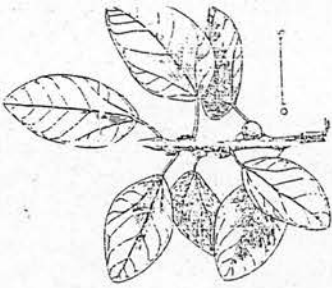


TREES

| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |   |                     |                      | MATURE HABIT    |         |                   |   |  | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|---|---------------------|----------------------|-----------------|---------|-------------------|---|--|--------|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD                     | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |  |        |
| DALEGERIA<br>SIBBOO<br>SIBBOO<br>SARBOU             |    | D                       | 25     | 10     | BRIGHT GREEN     | M       | RED-MIXED YELLOW<br>PALE YELLOW<br>EARLY SPRING | G                   | G                    | G               | N       | S                 |    |  |        |
| DELONIX<br>REGIA<br>FLAMBOYANT<br>TREE<br>BOINCIANA |    | D                       | 5      | N      | GREEN            | T       | RED-MIXED YELLOW<br>PALE YELLOW<br>EARLY SUMMER | G                   | G                    | T               | N       | S                 |   |  |        |
| ERYTHRINA<br>LYSIPTERON<br>INDICA<br>CORAL TREE     |  | D                       | N      | O      | BRIGHT GREEN     | B       | BRICK RED<br>EVERY SPRING                       | N                   | T                    | T               | N       | S                 |  |  |        |



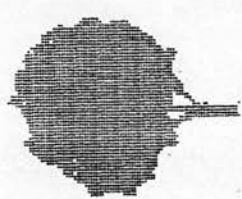
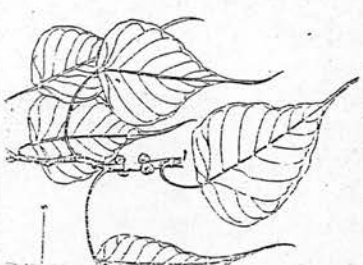

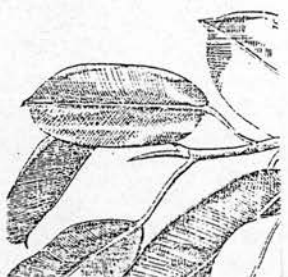
TREES

TREES

| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                                 |                     | MATURE HABIT         |                 |         |                  |   | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|---------------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--------|
|   |   | DECID.<br>OF<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD     | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| EUCALYPTUS<br>CITRIODORA<br>LEMON-SCENTED<br>(SPOTTED<br>GUM)<br>KAFUR<br>LIMOUNI |    | E                       | 45     | 12     | BLUE GREEN       | M       | YELLOW-GREEN<br>WHITE<br>SUMMER | G                   | G                    | E               | R       | G                |    |        |
| EUCALYPTUS<br>ROSTRATA<br>RED GUM<br>KAFUR  |    | E                       | 30     | 15     | BLUE GREEN       | M       | YELLOW-GREEN<br>WHITE<br>SUMMER | G                   | G                    | E               | R       | G                |   |        |
| FICUS<br>BENGHALENSIS<br>BANYAN TREE<br>TEEN BANGHALI                             |  | E                       | 30     | 15     | DEEP GREEN       | M       |                                 | G                   | G                    | G               | G       | G                |  |        |


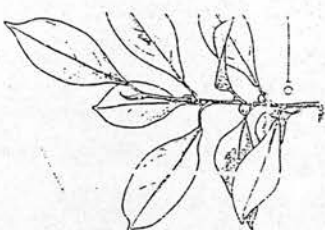

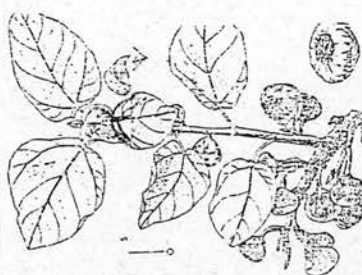

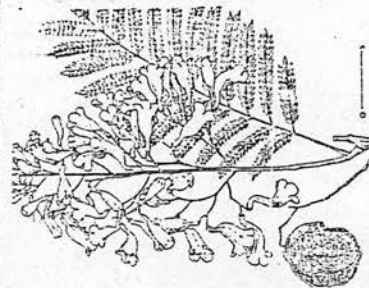
TREES

TREES

| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                    |                     | MATURE HABIT    |         |                  |   |  | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|------------------|---|--|--------|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |  |        |
| FICUS<br>BENJAMINA<br>WAXINGIN<br>TREE            |    | ✓                       | 5      | 0      | DEEP GREEN       | M       |                             | 5                  | 5                   | 5               | 5       | ✓                |    |  |        |
| FICUS<br>ELASTICA<br>RUBBER<br>PLANT<br>EL-NATTAT |    | ✓                       | 25     | 5      | DEEP GREEN       | B       |                             | 7                  | 7                   | 7               | 5       | ✓                |   |  |        |
| FICUS<br>RELIGIOSA<br>BO-TREE                     |  | ✓                       | 30     | 5      | DEEP GREEN       | B       |                             | 5                  | 7                   | 7               | 5       | ✓                |  |  |        |


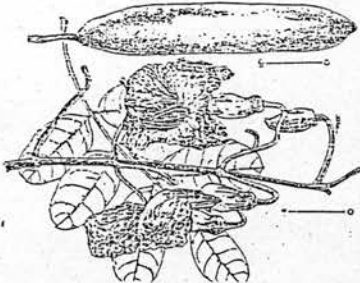
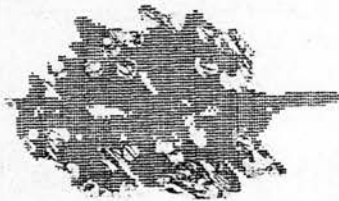



TREES

TREES

| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                   |   | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|-------------------|---|--------|
|   |   | DECID.<br>OR<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |        |
| <u>FICUS</u><br><u>RETUSA</u><br><u>(UNITIDA)</u><br><u>LAUREL FIG.</u><br><br><u>FICUS</u> |    | ✓                       | 25     | 15     | DEEP GREEN       | M       |                             | 0                   | 0                    | ✓               | M       | U                 |    |        |
| <u>FICUS</u><br><u>SYCOMORUS</u><br><u>SYCAMORE</u><br><u>TREE</u><br><u>GINMEIZ</u>        |    | ✓                       | 25     | 15     | DEEP GREEN       | B       |                             | F                   | F                    | 0               | M       | 0                 |   |        |
| <u>JACARANDA</u><br><u>ACUTIFOLIA</u>   |  | D                       | 15     | 7      | F                | F       |                             | P                   | F                    | P               | M       | 0                 |  |        |


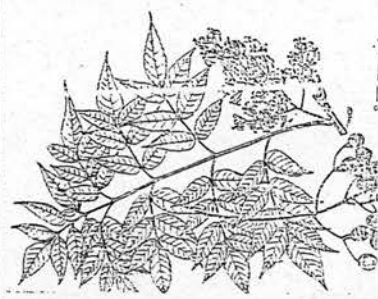

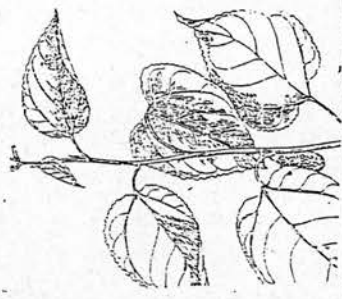

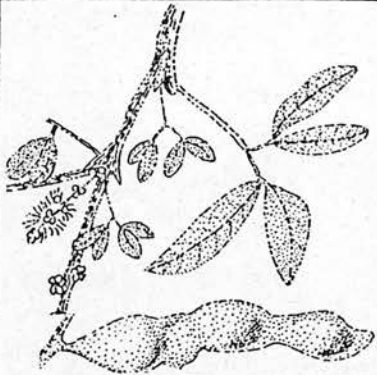
TREES



| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     |                      | MATURE HABIT    |         |                   |   |  | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|-------------------|---|--|--------|
|  |   | DECID.<br>OR<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |  |        |
| KIGELIA<br>PINNATA<br>SAUSAGE<br>TREE<br>MOHTURA   |    | W                       | 30     | 7      | GREEN            | M       | PALE YELLOW<br>SUMMER       | G                   | F                    | F               | M       | SC                |    |  |        |
| KHAYA<br>SENEGALENSIS<br>SENEGAL<br>WAGANY<br>KAYA |   | P                       | 25     | 10     | GREEN            | M       | RED<br>SUMMER               | G                   | G                    | F               | M       | SC                |    |  |        |
| MAGNOLIA<br>GRANDIFLORA<br>BULL BAY<br>MAGNOLIA    |  | W                       | 30     | 7      | DEEP GREEN       | D       | WHITE<br>SUMMER             | F                   | F                    | P               | M       | C                 |  |  |        |

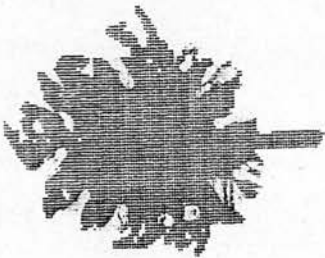
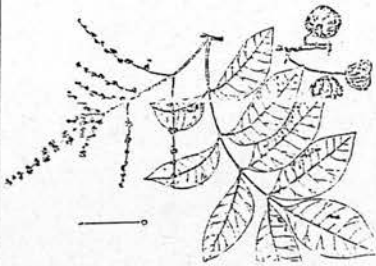

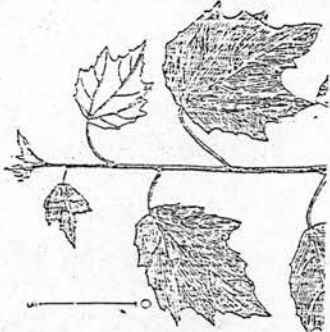

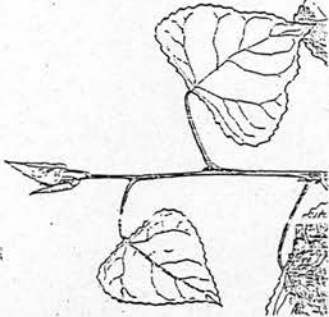


TREES

| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                    |                     | MATURE HABIT    |         |                   |   | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|-------------------|---|--------|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |        |
| NELIA<br>AZEDARACH<br>CHINA<br>BERRY<br>ZANZALACHT    |    | U                       | N      | O      | DEEP GREEN       | M       | LILAC SPRING                | U                  | U                   | U               | R       | S<br>U            |    |        |
| MORUS<br>ALBANIGRA<br>WHITE<br>MULBERRY<br>BOUT ABIAD |    | D                       | O      | V      | GREEN            | M       |                             | F                  | F                   | F               | F       | U                 |   |        |
| PITHECELLO-<br>BIUM DULCE<br>MADRAS<br>THORN          |  | U                       | U      | O      |                  |         |                             | U                  | F                   | U               | R       | U                 |  |        |

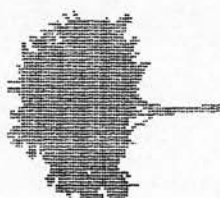
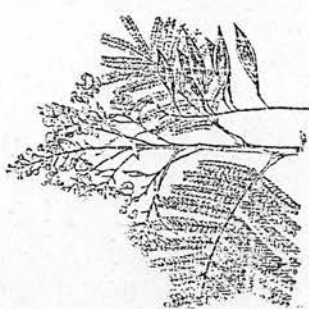
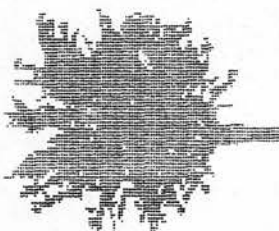

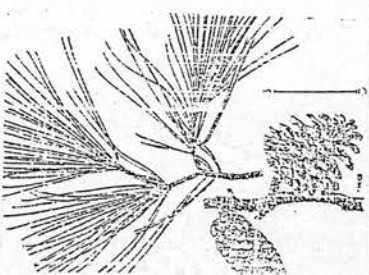
TREES

TREES


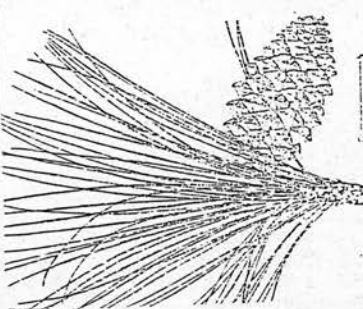


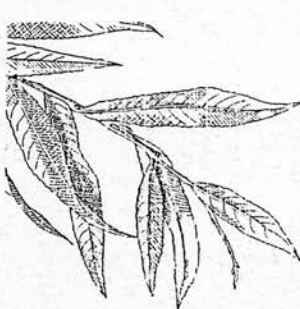
| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                  | DETAIL  |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|------------------|---|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |
| PLEIOGYNIUM<br>SOLANDRIENSE<br>BURDEKIN<br>PLUM<br>GAMBESIA |    | E                       | 20     | 7      | DEEP GREEN       | F       | GREENISH-YELLOW<br>SPRING   | F                   | F                    | F               | M       | S                |    |
| POPULUS<br>ALBA<br>WHITE<br>POPULAR<br>HOUR<br>ABAD         |    | D                       | 30     | 7      | DEEP GREEN       | M       |                             | F                   | G                    | G               | R       | U                |   |
| POPULUS<br>NIGRA<br>BLACK<br>POPULAR<br>HOUR<br>BAGS        |  | E                       | 25     | G      | LIGHT GREEN      | M       |                             | F                   | G                    | E               | R       | U                |  |

TREES

TREES

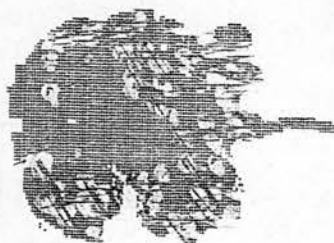
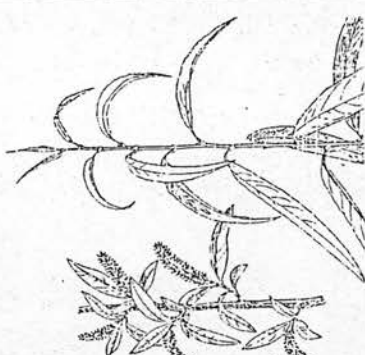
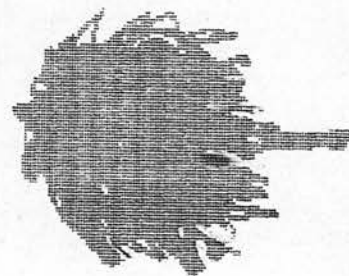
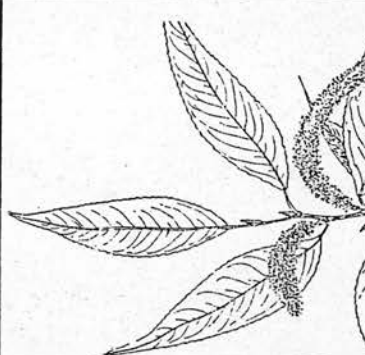


| NAME                                   | SHAPE   | CHARACTER                |        |        |                  |         |                             |                     |                      | MATURE HABIT    |         |                  |   |  | DETAIL |
|--|---|--------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--|--------|
|  |   | DECID.<br>or<br>EVERGRN. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |  |        |
| PROSOPIS<br>JULIFLORA<br>MESQUITE      |    | U                        | 6      | 4      | PALE GREEN       | TH      |                             | U                   | U                    | U               | M       | U                |    |  |        |
| PARKINSONIA<br>ACULEATA                |    | U                        | 7      | U      | GREEN            | TH      | YELLOW<br>SPRING            | U                   | U                    | TH              | N       | U                |   |  |        |
| PELTOPHORUM<br>AFRICANUM<br>COPPER POD |  | U                        | U      | U      | LIGHT GREEN      | M       | YELLOWISH-GREEN<br>SUMMER   | TH                  | TH                   | TH              | M       | U                |  |  |        |

TREES

| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     |                      | MATURE HABIT    |         |                   |   | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|-------------------|---|--------|
|  |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |        |
| PINUS<br>HAGENSI<br>ALEPPO<br>PINE<br>SONOBAR<br>HALABI      |    | U                       | R      | O      | BLUE GREEN       | F       |                             | G                   | E                    | G               | M       | G<br>4            |    |        |
| PINUS<br>LONGIFOLIA<br>CHIR PINE<br>SONOBAR                  |    | U                       | R      | S      | BLUE GREEN       | F       |                             | G                   | G                    | G               | M       | G<br>4            |   |        |
| SALIX<br>BABYLONICA<br>WEeping<br>WILLOW<br>SHAR-EL-<br>BINT |  | D                       | S      | S      | LIGHT GREEN      | M       |                             | F                   | F                    | F               | R       | U                 |  |        |




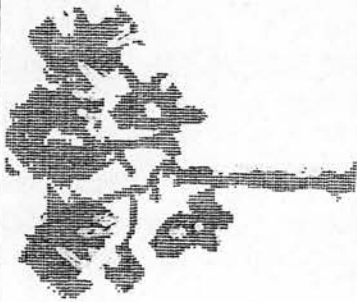
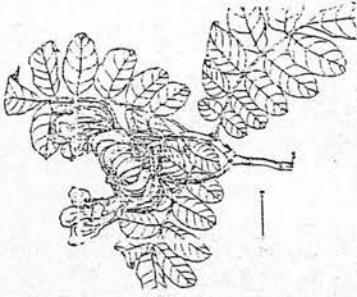

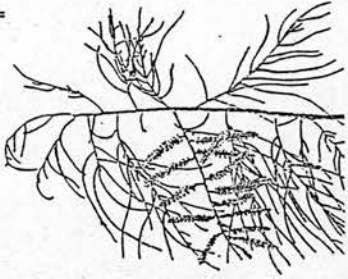
TREES

| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                   | DETAIL  |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|-------------------|---|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |
| <u>SALIX</u><br><u>SUBERRATA</u><br>PALESTINE<br>WILLOW<br><u>SAFSAF</u><br><u>BALADI</u> |    | D                       | Q      | 7      | LIGHT GREEN      | M       |                             | #                   | F                    | F               | R       | U                 |    |
| <u>SALIX</u><br><u>TETRAEPERNA</u><br><u>SAFSAF</u><br><u>KEDIR</u>                       |   | D                       | Q      | 7      | LIGHT GREEN      | M       |                             | #                   | #                    | F               | R       | U                 |   |
| <u>ESCHINUS</u><br><u>MOLLE</u><br>CALIFORNIA<br>PEPPER<br>FILFIL<br>BAFIE                |  | U                       | Q      | Q      | GREEN            | F       | WHITE SPRING                | #                   | G                    | U               | M       | U                 |  |

TREES


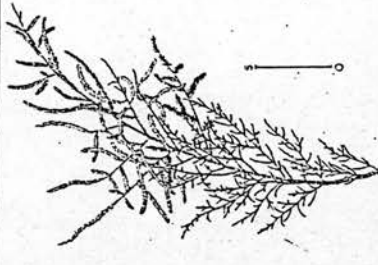



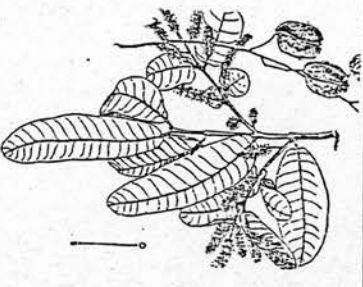


TREES


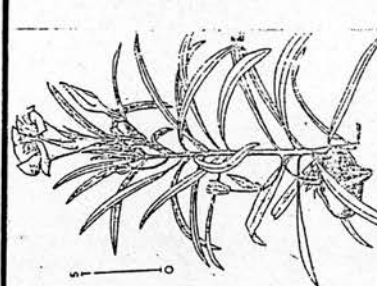
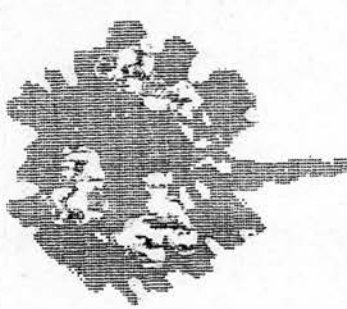
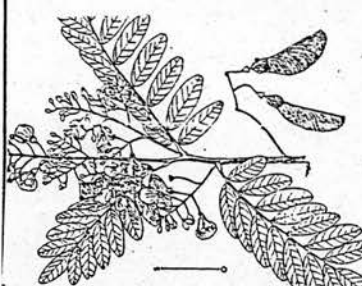

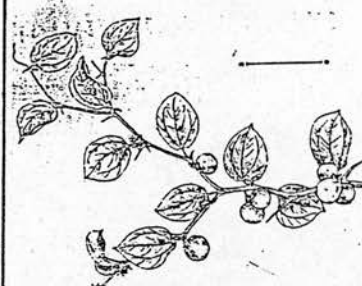
| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                   |   | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|-------------------|---|--------|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |        |
| SCHINUS<br>TOREBETHIF-<br>OLUS<br>BRAZILIAN<br>PEPPER TREE<br>FILFIL ARID |   | ✓                       | ○      | ∞      | DARK GREEN       | ✓       | WHITE<br>LATE SUMMER        | ○                   | ○                    | ○               | ✓       | ○                 |    |        |
| SPATHODEA<br>NILOTICA<br>AFRICAN<br>TULIP                                 |   | ✓                       | ○      | ∞      | DARK GREEN       | ✓       | RED & ORANGE<br>SPRING      | ✓                   | ✓                    | ○               | ○       |                   |   |        |
| TAMARIX<br>APHYLIA<br>"ARTICUATA"<br>ATHEL<br>TAMARISK<br>ATEL            |  | ✓                       | ✓      | ✓      | BLUE GREEN       | ✓       | PINK<br>SUMMER              | ✓                   | ✓                    | ✓               | ✓       | ✓                 |  |        |

TREES

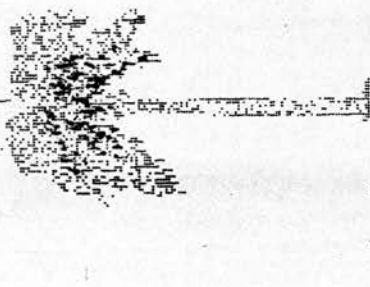
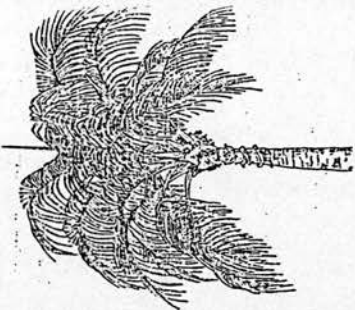
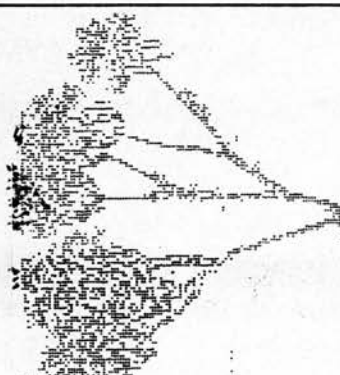
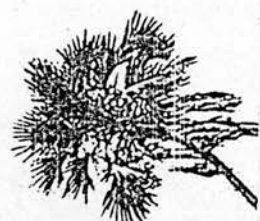
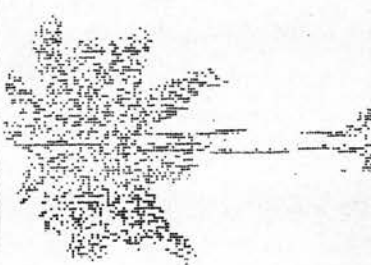
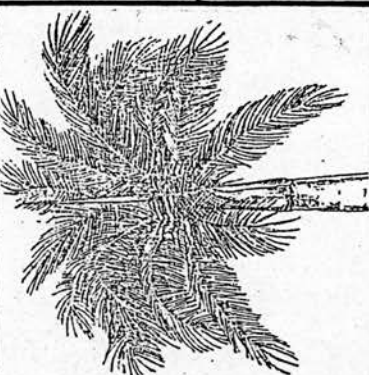
TREES

| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |  |                     | MATURE HABIT         |                 |         |                   | DETAIL  |
|---|---|-------------------------|--------|--------|------------------|---------|--|---------------------|----------------------|-----------------|---------|-------------------|---|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD              | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |
| TAMARIX<br>NIOOTICA<br>NILE<br>TAMARISK<br>TARFA ABAL |    | ✓                       | Q      | ✓      | BLUE GREEN       | ✓       | WHITE PINKISH<br>SUMMER                  | ✓                   | ✓                    | ✓               | F       | ✓                 |    |
| TELLOMA<br>STANS<br>YELLOW BELL<br>ELDER              |    | ✓                       | ∞      | ✓      | GREEN            | ✓       | BRIGHT YELLOW<br>LATE SPRING &<br>SUMMER | ✓                   | ✓                    | ✓               | ✓       | ✓                 |   |
| TERMINALIA<br>ARJUNA<br>INDIAN<br>ALMOND              |  | ✓                       | ∞      | ✓      | DARK GREEN       | ✓       | GREENISH<br>EARLY SUMMER                 | ✓                   | ✓                    | ✓               | ✓       | ✓                 |  |

TREES

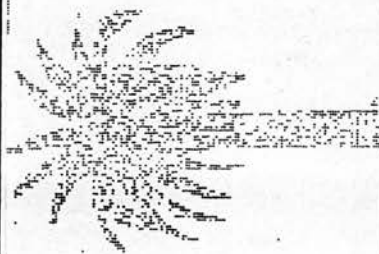
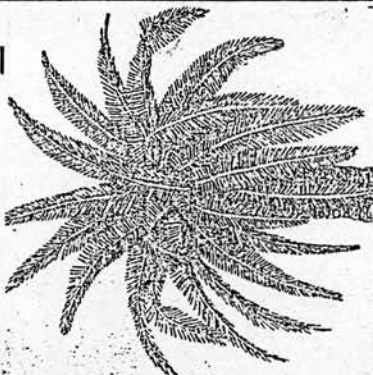

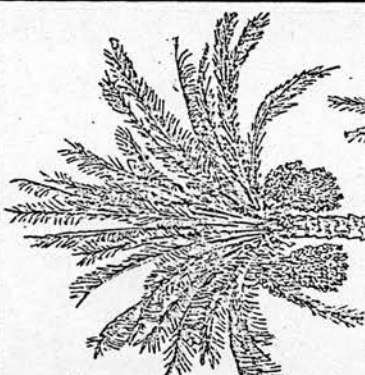
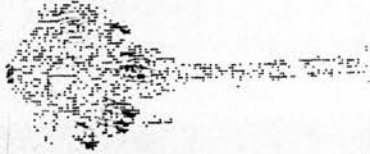
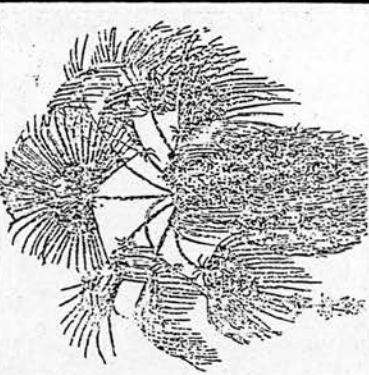
| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |                             |                    |                     | MATURE HABIT    |         |                  |   |  | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|------------------|---|--|--------|
|  |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |  |        |
| THEVETIA<br>NERCIFOLIA<br>YELLOW<br>OLEANDER |    | ✓                       | Q      | Q      | BLUE GREEN       | F       | YELLOW<br>SUMMER            | ✓                  | ✓                   | ✓               | R       | ✓<br>U           |    |  |        |
| TIPUANATIPU<br>TIPU TREE                     |    | ✓                       | ✓      | Q      | GREEN            | M       | YELLOW<br>LATE SPRING       | ✓                  | ✓                   | ✓               | N       | ✓                |   |  |        |
| ZIZIPHUS<br>SPINACHRISTE<br>SIDDER<br>NABO   |  | ✓                       | ✓      | Q      | LIGHT GREEN      | M       | GREENISH YELLOW<br>SUMMER   | ✓                  | ✓                   | ✓               | ✓       | ✓<br>U           |  |  |        |

PALM

| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     |                      | MATURE HABIT    |         |                   |   |  | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|-------------------|---|--|--------|
|  |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |  |        |
| ARECATHUM<br>RONANZOFF-<br>JANUN<br>QUEEN PALM                     |    | U                       | SO     | 6      | GREEN            | M       |                             | +                   | G                    | G               | S       | S                 |    |  |        |
| HYPHAENE<br>THEBAICA<br>TODDY<br>PALM<br>DOAM                      |   | U                       | Q      | 6      | DEEP GREEN       | M       |                             | U                   | G                    | U               | S       | S                 |    |  |        |
| OREDOXA<br>REGIA<br>(ROYSTONCAR)<br>ROYAL PALM<br>NAHL<br>EL NEUKY |  | U                       | SO     | 8      | GREEN            | M       |                             | G                   | G                    | G               | S       | S                 |  |  |        |
| PALM TREES   |   |                         |        |        |                  |         |                             |                     |                      |                 |         |                   |   |  |        |




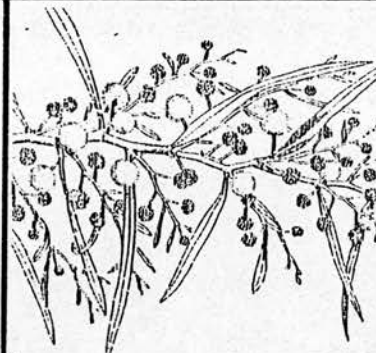

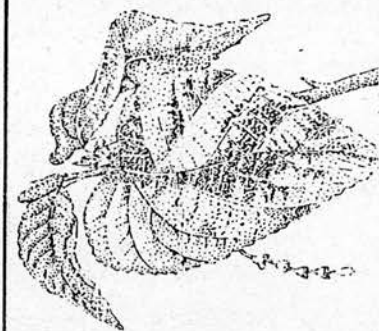
PALM

| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                    |                     | MATURE HABIT    |         |                  |   |  | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|------------------|---|--|--------|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |  |        |
| PHOENIX<br>CANARIENSIS<br>CANARY<br>PALM<br><br>NAKHEL<br>KANARY  |    | ✓                       | 5      | 8      | DEEP GREEN       | M       |                             | G                  | G                   | ✓               | ✓       | ✓                |    |  |        |
| PHOENIX<br>DACTYLIFERA<br>DATE PALM<br><br>NAKHEL<br>BAJAH        |   | ✓                       | 30     | 10     | BLUE GREEN       | G       |                             | G                  | G                   | ✓               | ✓       | ✓                |   |  |        |
| WASHINGTONIA<br>ROBUSTA<br>WASHINGTON<br>PALM<br><br>WASHINGTONIA |  | ✓                       | 30     | 6      | GREEN            | B       |                             | G                  | G                   | ✓               | M       | ✓                |  |  |        |

PALM TREES




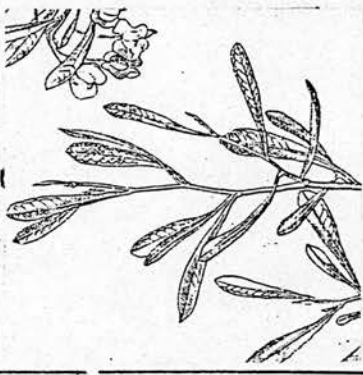


SHRUBS

| NAME                                      | SHAPE   | CHARACTER               |        |        |                               |         |                              |                     | MATURE HABIT         |                 |         |                   |  | DETAIL |
|---|---|-------------------------|--------|--------|-------------------------------|---------|------------------------------|---------------------|----------------------|-----------------|---------|-------------------|--|--------|
|   |   | DECID.<br>OR<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR              | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD  | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |  |        |
| ACACIAS<br>SPP<br><br>BAYYAL              |  | D                       | 3      | 3      | GREEN                         | F       | YELLOW WHITE<br>EARLY SUMMER | G                   | G                    | G               | R       | S<br>U            |   |        |
| ACALYPHA<br>WILKESIANA                    |  | U                       | U      |        | GREY/GREEN TO<br>BROWNISH RED | M       | GREEN OR RED<br>SPRING       | G                   | G                    | G               | R       | U                 |  |        |
| ATRIFLEX<br>HALIMUS<br>SALT BUSH<br>QAJAF |   | U                       | U      |        | BLUE-GREEN                    | M       | WHITE SPRING                 | T                   | T                    | T               | M       | U                 |  |        |




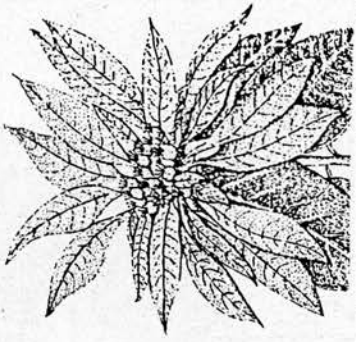

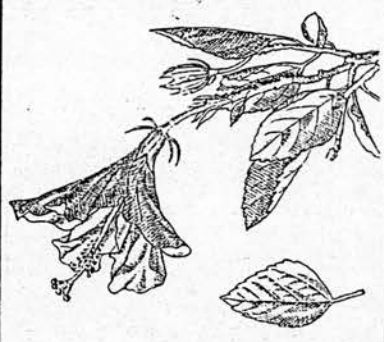
SHRUBS

## SHRUBS

| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                   | DETAIL  |
|--|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|-------------------|---|
|  |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |
| CAESALPINIA<br>PULCHERRIMA<br>PEACOCK<br>TREE    |   | E                       | 2      |        | GREEN            | F       | ORANGE RED<br>SPRING        | G                   | G                    | F               | R       | S<br>C            |    |
| CASSIA<br>MULTIJUGA<br>SANT                      |    | E                       | 3      |        |                  |         |                             | F                   | F                    | G               | N       | C                 |   |
| DODONEA<br>VISCOSA<br>HORSEED<br>BUSH<br>DODONEA |  | E                       | 3      | 2      | LIGHT GREEN      | M       | GREENISH YELLOW<br>SPRING   | C                   | C                    | C               | M       | C                 |  |


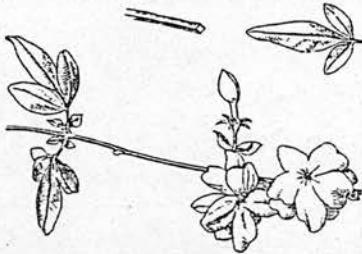



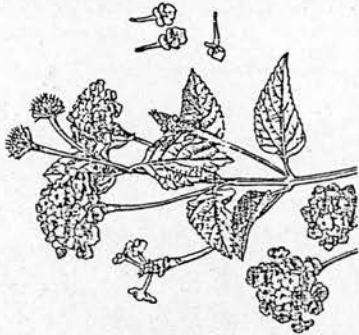
## SHRUBS

SHRUBS

| NAME                                       | SHAPE   | CHARACTER               |        |        |                  |         |                                       |                     | MATURE HABIT         |                 |         |                   |   | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|---------------------------------------|---------------------|----------------------|-----------------|---------|-------------------|---|--------|
|  |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD           | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |        |
| DURANTA<br>REPENS                          |    | 3                       | 3      | 3      | LIGHT GREEN      | W       | BLUE<br>SPRING                        | 5                   | 5                    | 5               | 2       | 5<br>U            |    |        |
| EUPHORBIA<br>FULCHRA-<br>LINA<br>FONSETTIA |    | D                       | 3      | 1      | DEEP GREEN       |         | PINK WHITE<br>SPRING                  | 7                   | 7                    | 7               | 2       | U                 |   |        |
| HIBISCUS<br>SPP<br>'H. ROSE-<br>'SINENSIS' |  | 5/D                     | 3      | 2      | GREEN            |         | WHITE, YELLOW<br>ORANGE, PINK, SPRING | 5                   | 5                    | 7               | W       | U                 |  |        |
| GARAS                                      |   |                         |        |        |                  |         |                                       |                     |                      |                 |         |                   |   |        |

SHRUBS


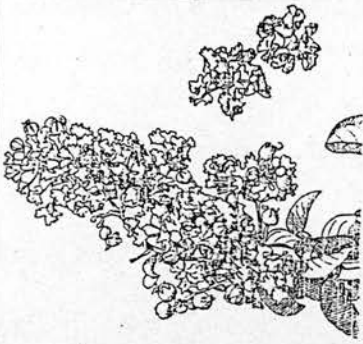

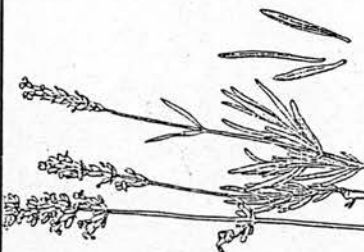


SHRUBS

| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     |                      | MATURE HABIT    |         |                  |   |  | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--|--------|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |  |        |
| JASMINUM<br>FRIMULINUM                                      |    | M                       | N      | N      | DARK GREEN       | M       | BRIGHT YELLOW<br>SPRING     | G                   | G                    | G               | M       | C                |    |  |        |
| JASMINUM<br>JAMBAC<br>FLORAPLENA<br>ARABIN<br>JASMIN<br>FIL |    | M                       | -      | G      | DARK GREEN       | M       | WHITE<br>SPRING & SUMMER    | G                   | G                    | π               | M       | C                |    |  |        |
| LANTANA<br>CAMARA<br><br>ONEKATHOM                          |  | M                       | 1.5    | G      | DARK GREEN       |         | WHITE                       | G                   | G                    | G               | M       | C                |  |  |        |

SHRUBS






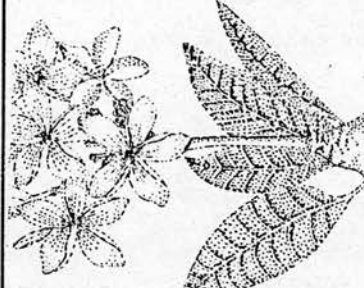


SHRUBS

| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                   |   | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|-------------------|---|--------|
|  |   | DECID.<br>OF<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |        |
| <u>LOGANIUM</u><br>INDICA<br><br>HENA<br>FAZANGI         |    | E                       | 3      | N      | LIGHT GREEN      | M       | VIOLET<br>SPRING            | G                   | F                    | G               | M       | C                 |    |        |
| <u>LAVANDULA</u><br>A. GUSTIFALIA<br>LAVENDE<br>LAVENDER |    | E                       | 1.5    | 1      | DARK GREEN       | F       | VIOLET                      | G                   | G                    | G               | M       | G                 |   |        |
| <u>NERIUM</u><br>OLEANDER<br><br>WARDER<br>HOWAR         |  | E                       | 3      | .      | DARK GREEN       | M       | PINK<br>SPRING SUMMER       | G                   | G                    | G               | R       | C                 |  |        |

SHRUBS


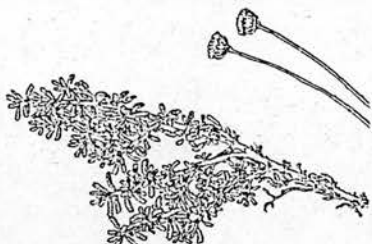






SHRUBS


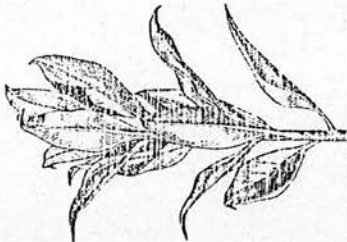
| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                                    |                    | MATURE HABIT        |                 |         |                  |   | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|------------------------------------|--------------------|---------------------|-----------------|---------|------------------|---|--------|
|   |   | DECID.<br>OF<br>EVERGRN | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD        | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| PLUMBAGO<br>CAPENSIS<br>CAPE<br>PLUMBAGO<br>JASMIN<br>AZERQ |    | U                       | 1      | 1      | LIGHT GREEN      | F       | WHITE - PINK BLUE<br>SPRING SPRING | F                  | F                   | F               | R       | S<br>U           |    |        |
| PLUMERIA<br>ACUTIFOLIA<br>FRANGIPANI<br>JASMIN<br>HINDI     |    | D                       | 3      | 2      | GREEN            | D       | WHITE<br>SPRING SUMMER             | F                  | F                   | F               | M       | U                |   |        |
| RICINUS<br>COMMUNIS<br>CASTOR<br>BEAN<br>KHARWA             |  | D                       | 3      | 3      | GREEN            | D       | WHITE GREENISH<br>SPRING           | U                  | F                   | U               | N       | U                |  |        |


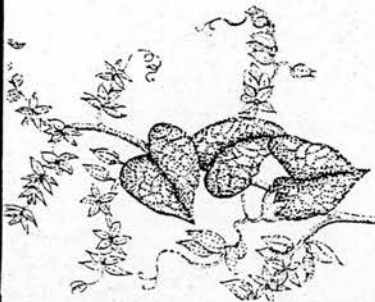



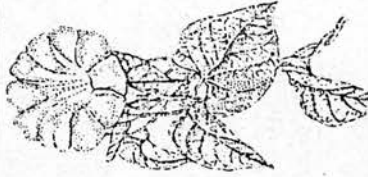
SHRUBS

SHRUBS

| NAME  | SHAPE   | CHARACTER               |         |        |                  |         |  |                    | MATURE HABIT        |                 |         |                  | DETAIL  |
|---|---|-------------------------|---------|--------|------------------|---------|--|--------------------|---------------------|-----------------|---------|------------------|---|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT  | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD                    | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |
| CHAMAECY-<br>PARISUS<br>LAVENDER<br>COTTON<br>SHRUB |    | M                       | 0-300.0 |        | BLUE GREEN       | F       | YELLOW<br>SUMMER                               | G                  | G                   | G               | M       | G                |    |
| ROSA<br>GRANDIFLORA<br>ROSE<br>WARD<br>PALADY       |    | D                       | 0       | 5      | DEEP GREEN       | M       | RED, PINK, YELLOW<br>WHITE, SPRING -<br>SUMMER | TI                 | G                   | G               | M       | U                |   |
| ROSA<br>POLYANTHA<br>POLYANTHA<br>ROSE<br>WARD      |  | D                       | 4       | G      | DEEP GREEN       | M       | WHITE, RED, PINK<br>SPRING                     | TI                 | G                   | TI              | N       | U                |  |

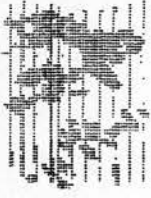
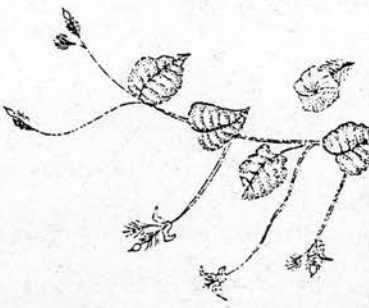

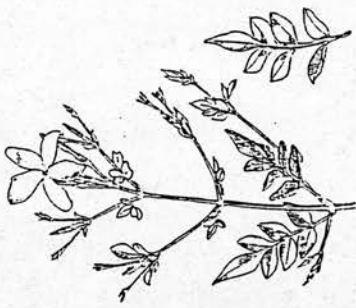
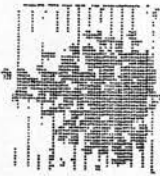

SHRUBS

| NAME               | SHAPE   | CHARACTER               |        |        |                  |         |                             |                    |                     | MATURE HABIT    |         |                  |   |  | DETAIL |
|--------------------|---|-------------------------|--------|--------|------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|------------------|---|--|--------|
|                    |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |  |        |
| MYOPORUM<br>LAETUM |  | 3                       | 4      | 3      | DEEP GREEN       | W       | WHITE SPRING                | G                  | G                   | G               | R       | S                |  |  |        |
| MYOPORUM           |   |                         |        |        |                  |         |                             |                    |                     |                 |         |                  |   |  |        |
| BAZBOOMIA          |   |                         |        |        |                  |         |                             |                    |                     |                 |         |                  |   |  |        |
|                    |   |                         |        |        |                  |         |                             |                    |                     |                 |         |                  |   |  |        |
|                    |   |                         |        |        |                  |         |                             |                    |                     |                 |         |                  |   |  |        |
|                    |   |                         |        |        |                  |         |                             |                    |                     |                 |         |                  |   |  |        |

| NAME   | SHAPE   | CHARACTER               |        |        |                  |         |  | MATURE HABIT       |                     |                 |         |                  |   | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|--|--------------------|---------------------|-----------------|---------|------------------|---|--------|
|  |   | DECID.<br>OF<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD              | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| ANTIGUUM<br>LEPTOPUS<br>CORAL VINE.<br>KARKOLA |    | U                       | G      |        | GREEN            | TI      | WHITE-PINKISH-RED<br>SPRING              | TI                 | TI                  | TI              | R       | SCU              |    |        |
| BOUGAINVILLEA<br>VARIETIES<br>GOHANJAMIA       |    | U                       | D      |        | BRIGHT GREEN     | 3       | VIOLET-RED-ORANGE<br>YELLOW-WHITE SPRING | TI                 | TI                  | TI              | N       | U                |   |        |
| IPOMOEA<br>LEARDI<br>MORNING<br>GLORY          |  | U                       | G      |        | DEEP GREEN       | 3       | BLUE PURPLE<br>SPRING                    | TI                 | TI                  | TI              |         | SCU              |  |        |




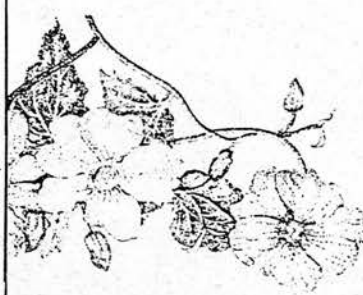

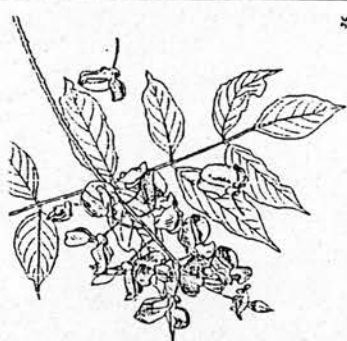





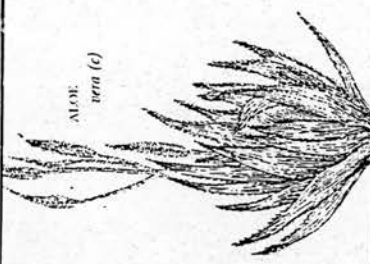

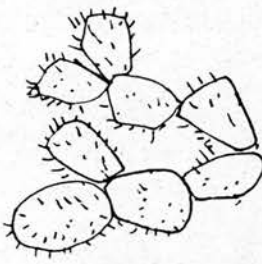
## CLIMBERS




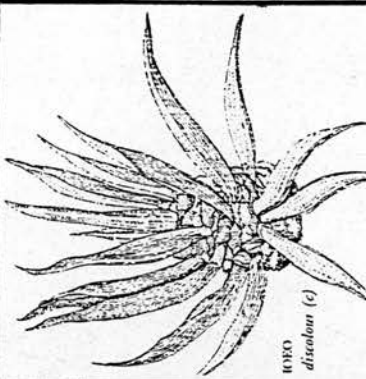

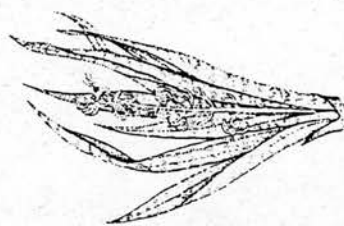
| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                    |                     | MATURE HABIT    |         |                  |   | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|------------------|---|--------|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| JACQUEMONTIA<br>PENTANTHA                               |    | E                       | 3      |        | BLUE GREEN       | F       | VIOLET<br>BLUE              | G                  | G                   | F               | R       | S<br>C           |    |        |
| JASMINUM<br>GRANDIFLORUM<br>JASMINE<br>JASMIN<br>BALADI |    | E/D                     | 5      |        | DEEP GREEN       |         | WHITE<br>SPRING - SUMMER    | G                  | F                   | F               | R       | S<br>C           |   |        |
| JASMINUM<br>OFFICINALE<br>COMMON<br>WHITE<br>JASMINE    |  | E/D                     | 8      |        | DEEP GREEN       |         | WHITE<br>SPRING             | F                  | F                   | F               | R       | S<br>C           |  |        |





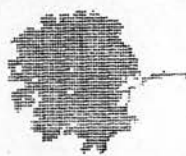
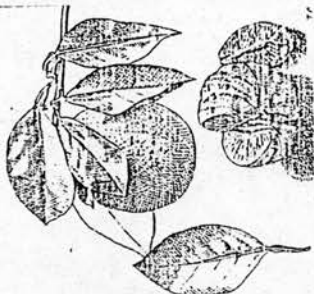
## CLIMBER






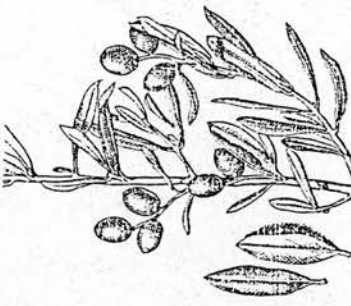

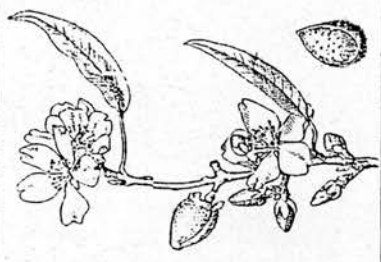
| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                    |                     | MATURE HABIT    |         |                  |   |  | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|------------------|---|--|--------|
|   |   | DECID.<br>OF<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |  |        |
| QUISQUALIS<br>INDICA<br>RANGOON<br>CREEPER              |    | ○                       | 3      |        | BLUE GREEN       | 3       | WHITE RED<br>SPRING         | 7                  | 7                   | 7               | R       | ○<br>S           |    |  |        |
| THUNDERGIA<br>GRANDIFLORA                               |    | ○                       | 3      |        | GREEN            | 3       | WHITE BLUE<br>SPRING        | 7                  | 7                   | 7               | N       | S                |   |  |        |
| WISTERIA<br>SINENSIS<br>CHINESE<br>WISTERIS<br>WISTERIA |  | □                       | 5      |        | GREEN            | 3       | VIOLET BLUE<br>SPRING       | 5                  | 5                   | 7               | R       | ○<br>S           |  |  |        |

| NAME   | SHAPE   | CHARACTER               |          |          |                  |         |                               |                     |                      | MATURE HABIT    |         |                  |   |  | DETAIL |
|--|---|-------------------------|----------|----------|------------------|---------|-------------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--|--------|
|  |   | DECID.<br>or<br>EVERGR. | HEIGHT   | SPREAD   | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD   | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |  |        |
| AGAVE<br>SISALAWA<br>SISAL HEMP<br>SABAR<br>AMERICAN |    | ✓                       | 5'<br>5' | 5'<br>5' | BLUE GREEN       | B       | CREAMY / SPRING               | ✓                   | ✓                    | ✓               | ✓       | ✓                |    |  |        |
| ALOE VERA  |    | ✓                       | 1'       | 1'       |                  | B       | ORANGE RED<br>SPRING & SUMMER | ✓                   | ✓                    | ✓               | ✓       | ✓                |   |  |        |
| OPUNTIA<br>DILLENI<br>PRICKLY<br>PEAR<br>TENSHOKY    |  | ✓                       | 4'       | 5'       |                  | B       | CREAMY<br>SPRING              | ✓                   | ✓                    | ✓               | ✓       | ✓                |  |  |        |


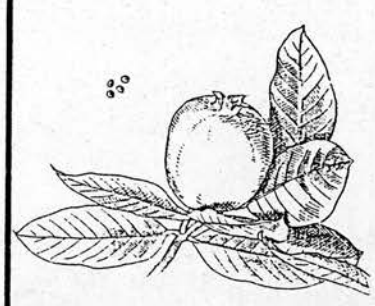




| NAME                     | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                  |   | DETAIL |
|--------------------------|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--------|
|                          |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| NESEMBRYAN<br>THEMUM SPP |    | ✓                       | 20"    | 10"    | DEEP GREEN       | F       | YELLOW<br>SPRING            | ✓                   | ✓                    | ✓               | ✓       | ✓                |    |        |
| HA1-ELAM                 |    | ✓                       | 50-50  |        | BLUE GREEN       | M       |                             | ✓                   | ✓                    | ✓               | ✓       | ✓                |    |        |
| RHOEO<br>DICOLOR         |  | ✓                       | 50-30  |        | BLUE GREEN       |         | YELLOW GREENISH<br>SPRING   | ✓                   | ✓                    | ✓               | ✓       | ✓                |  |        |


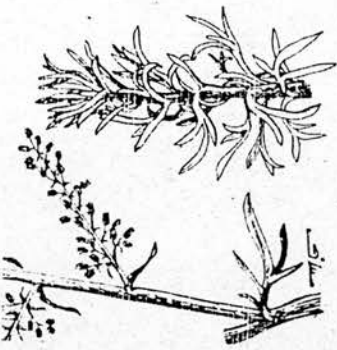

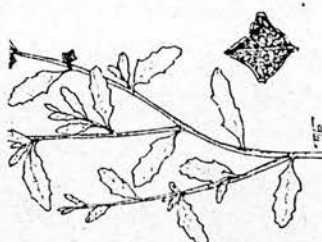

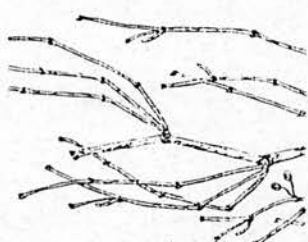
| NAME  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                  |   | DETAIL |
|---|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--------|
|   |   | DECID.<br>or<br>EVERGRN | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| CERATONIA<br>SILIOUA<br>CAROB<br>KHAROB           |    | ✓                       | 6      | ✓      | DEEP GREEN       | ✓       |                             | ✓                   | ✓                    | ✓               | ✓       | ✓                |    |        |
| CITRUS<br>LIMON<br>LEMON<br>LIMOON                |    | ✓                       | 5      | 4      | GREEN            | ✓       | WHITE<br>SPRING             | ✓                   | ✓                    | ✓               | ✓       | ✓                |    |        |
| CITRUS<br>SINENSIS<br>SWEET<br>ORANGE<br>PORTOKAL |  | ✓                       | 6      | 5      | DEEP GREEN       | ✓       | WHITE<br>SPRING             | ✓                   | ✓                    | ✓               | ✓       | ✓                |  |        |






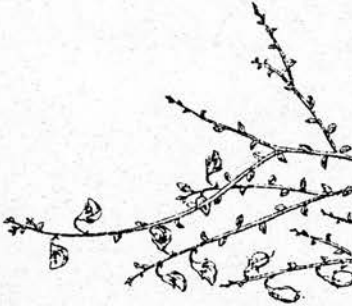

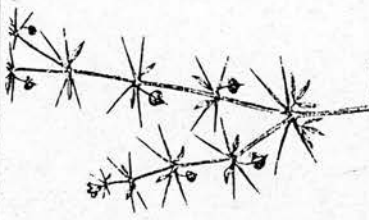
| NAME                                  | SHAPE   | CHARACTER               |        |        |                  |         |                             |                    |                     | MATURE HABIT    |         |                  |   |  | DETAIL |
|---------------------------------------|---|-------------------------|--------|--------|------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|------------------|---|--|--------|
|                                       |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |  |        |
| FIGUS CARICA<br>EDIBLE FIG.<br>TIGEN  |    | D                       | 3      | 3      | DEEP GREEN       | 2       | WHITE-YELLOWISH<br>SPRING   | 0                  | 0                   | 0               | 2       | 0                |    |  |        |
| OLIVA<br>EUROPAEA<br>OLIVE<br>ZITTOON |    | 0                       | 6      | 6      | BLUE GREEN       | 7       | YELLOW<br>SPRING            | 0                  | 0                   | 0               | 0       | 0                |    |  |        |
| PRUNUS<br>AMYGDALS<br>ALMOND<br>LOZ   |  | D                       | 8      | 6      | GREEN            | 7       | PINK<br>SPRING              | 0                  | 0                   | 0               | 3       | 0                |  |  |        |




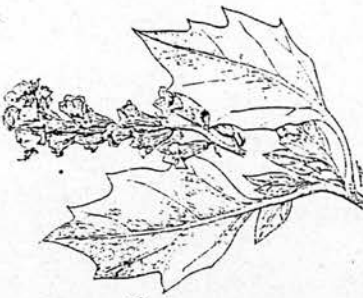

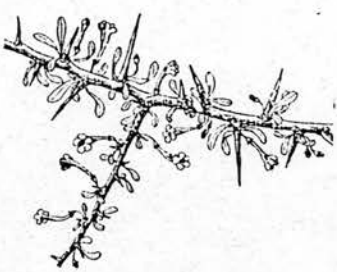

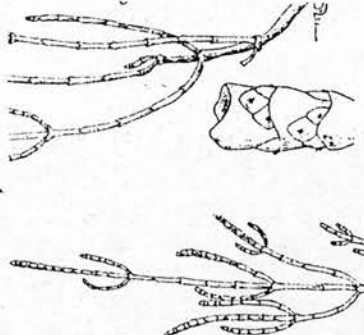
| NAME                                       | SHAPE   | CHARACTER               |        |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                  |   | DETAIL |
|--|---|-------------------------|--------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--------|
|  |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| PSIDIUM<br>QUAJAVA<br>GUAYZ<br>GAWAVA      |    | 0                       | 0      | 0      | BRIGHT GREEN     | F       | WHITE<br>SPRING             | 0                   | F                    | F               | M       | 0<br>S           |    |        |
| PUNICAGRAN<br>TUM<br>POMEGRANATE<br>ROMMAN |    | 0                       | 0      | 0      | DEEP GREEN       | F       | RED<br>SPRING               | 0                   | 0                    | 0               | M       | 0<br>S           |    |        |
| VITIS<br>VINIFERA<br>GRAPE<br>EIVAP        |  | 0                       | 0      | 1      | GREEN            | M       | WHITE<br>SPRING             | 0                   | 0                    | 0               | F       | 0<br>S           |  |        |

| NAME                                | SHAPE   | CHARACTER               |        |        |                  |         |                             |                    |                     | MATURE HABIT    |         |                   |   |  | DETAIL |
|-------------------------------------|---|-------------------------|--------|--------|------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|-------------------|---|--|--------|
|                                     |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ACTION |   |  |        |
| ARTEMISIA<br>MONOSPERM<br><br>ANDER |    | ☐                       | 100    | 1      | BLUE GREEN       | F       |                             | ☐                  | ☐                   | ☐               | R       | S                 |    |  |        |
| ATRIPEX<br>HALIMUS<br>OATF          |    | ☐                       | 3      | 3      | DEEP GREEN       | F       |                             | ☐                  | ☐                   | ☐               | N       | S                 |    |  |        |
| CALLIGONUM<br>COMOSUM<br><br>ARTA   |  | ☐                       | 170    | 1      | WHITE GREY       | F       |                             | ☐                  | ☐                   | ☐               | M       | S                 |  |  |        |


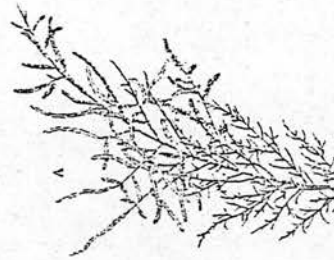

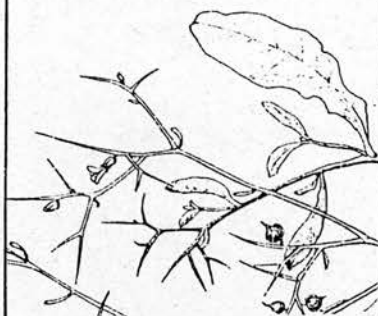

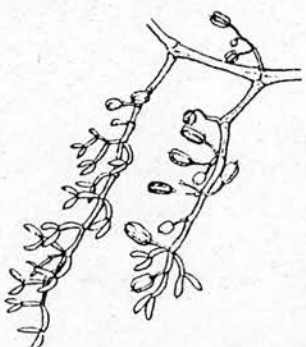
WILD PLANTS AROUND THE E.N.T. SITES.

| NAME                                 | SHAPE   | CHARACTER               |        |        |                    |         |                             |                     | MATURE HABIT         |                 |         |                  |   | DETAIL |
|--------------------------------------|---|-------------------------|--------|--------|--------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--------|
|                                      |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR   | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLERANCE | DROUGHT<br>TOLERANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| CORNULACA<br>MONACANTHA<br><br>HAAR  |    | ✓                       | 0.50.5 |        | GREENISH<br>GLASSY | F       |                             | ✓                   | ✓                    | ✓               | M       | S                |    |        |
| CROTALARIA<br>AEGYTICA<br><br>NATASH |    | ✓                       | 5'     | 1      | BLUE GREEN         | TI      | YELLOW<br>SPRING SUMMER     | ✓                   | ✓                    | ✓               | N       | S                |   |        |
| FAGONIA<br>ARABICA<br><br>GAND       |  | ✓                       | 5'     | 5'     | GREENISH GREY      | TI      | PINK + ROSE<br>SPRING       | ✓                   | ✓                    | ✓               | N       | S                |  |        |

WILD PLANTS AROUND THE E.N.T. SITE

| NAME                    | SHAPE   | CHARACTER               |        |        |                     |         |                             |                    | MATURE HABIT        |                 |         |                  |   | DETAIL |
|-------------------------|---|-------------------------|--------|--------|---------------------|---------|-----------------------------|--------------------|---------------------|-----------------|---------|------------------|---|--------|
|                         |   | DECID.<br>or<br>EVERGR. | HEIGHT | SPREAD | LEAVES<br>COLOUR    | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE | DROUGHT<br>TOLRANCE | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| HYSCYANUS<br>MUTICUS    |    | E                       | 20     | 1.20   | GREENISH<br>GREY    | M       | WHITE<br>SPRING             | 0                  | 0                   | 0               | 2       | 0                |    |        |
| LYCIUM<br>SHAUI         |    | 0                       | 15     | 2      | BLUE GREEN          | TI      | WHITE + VIOLET<br>SPRING    | 0                  | 0                   | 0               | M       | 0                |   |        |
| SAHANON                 |   |                         |        |        |                     |         |                             |                    |                     |                 |         |                  |   |        |
| SALICORNIA<br>FRUTICOSA |  | 0                       | 1      | 1      | BROWNISH -<br>GREEN | TI      |                             | 0                  | 0                   | 0               | M       | 0                |  |        |
| ABU SAAQ                |   |                         |        |        |                     |         |                             |                    |                     |                 |         |                  |   |        |



| NAME                                      | SHAPE   | CHARACTER               |         |        |                  |         |                             |                     | MATURE HABIT         |                 |         |                  |   | DETAIL |
|---|---|-------------------------|---------|--------|------------------|---------|-----------------------------|---------------------|----------------------|-----------------|---------|------------------|---|--------|
|   |   | DECID.<br>or<br>EVERGR. | HEIGHT  | SPREAD | LEAVES<br>COLOUR | TEXTURE | FLOWER<br>COLOUR,<br>PERIOD | SALINE<br>TOLRANCE. | DROUGHT<br>TOLRANCE. | WIND<br>RESIST. | GROWING | PROPAG.<br>ATION |   |        |
| TAMARIX<br>NILOTICA<br><br>HATAB<br>AHMAR |    | ☑                       | 3       | ☐      | BLUE GREEN       | 7       | WHITE<br>SPRING             | ☑                   | ☑                    | ☑               | M       | S                |    |        |
| ZILLA<br>SPINOZA<br><br>KHREIT            |    | ☑                       | 0.5-1.5 | ☐      | BRIGHT GREEN     | 7       | YELLOW WHITE<br>SPRING      | ☑                   | ☑                    | ☑               | R       | S                |   |        |
| ZYGOPHYLLUM<br>LOCCINEUM<br><br>SILVA     |  | ☑                       | 50-100  | ☐      | GREENISH GREY    | 7       | PINK PURPLE<br>SPRING       | ☑                   | ☑                    | ☑               | M       | S                |  |        |



## APPENDIX: B

### Field study index

This section is primarily a brief record of the author's field study and a summary of the sources of the study material for the case studies. As mentioned earlier, the author spent 10 weeks (starting at the end of January 1987) visiting the E.N.T. sites to collect data and information about the E.N.T. As far as possible, the information collected in this study is up to date and the observations made and conclusions drawn are the author's own. Many people and organisations were consulted during the visits.

The information centre of the Ministry of Housing and Reconstruction (1 Ismail Abaza Street, El Qasser El Any) was visited. It was one of the most important sources of information regarding the E.N.T. plan. The Director, Mrs. Dalal Amren, and the staff were very helpful. Most of the Main Report of the E.N.T. used in this study was obtained from this centre. The author then started his survey of E.N.T. sites carrying the plans and data obtained, meeting and interviewing the authorities and residents of the E.N.T.

On 12th and 13th February, 1987 the author visited 6th of October New Town, 20 km west of Cairo. The following employees of the Development Corporation were interviewed as follows: Mr. M. Nasr, Civil Engineer (Director of the project), Mr. M. Amin (Architect) (design team), Mr. S. Kamel (Architect on site). Mr. Kamel and the author went around the site looking for the problems that faced landscape construction in different parts of the city. There is no Landscape Architect nor even an Agricultural Engineer. Some of the residents were interviewed in the streets, at their homes and at the central mosque. The author, using camera, sketches and notes, made a tour around the site

accompanied by Mr. Amin.

Tenth of Ramadan New Town was subsequently visited on 14th, 15th, 16th and 17th of February, 1987. Mr. M. Refat, (Architect) (project Director), Mr. A. Magday, (Architect) (design team) and Mr. Atif, (Architect) (on site) were interviewed. Many of the residents were interviewed on the site over a period of three days. Most of them are young couples who just arrived in the city six or eight months earlier. Site observation was undertaken, in general for the city and more specifically for one of the open spaces of Neighbourhood (2) according to the check list attached.

On 22nd February, 1st, 2nd and 3rd March, 1987, Sadat city was visited. Mr. M. Monier, Director of the project, Mr. Monir Loty, Mr. A. El Saied (Architect) project Directors, Mr. H. Abo El Foutoh (Agricultural Engineer) (Director of Agriculture Department) and Mr. B. Gowaly were interviewed at the the Sadat City Development Corporation. Site observation was carried out around the city and the residents interviewed. The strangest thing is that there are quite a number of people who work in the city and return to their homes in Cairo every day.

The 15th of May New Town was visited on 7th and 8th March. The Department of Agriculture, which is responsible for the landscape development was approached. Awareness of the landscape needs of this new town was evident. The author made an interesting tour with the help of the Director of the Department, Mr. A. Hessin and Mr. H. Henany, exploring the landscape problems of the site. Some of the residents were interviewed during tours lasting two days. Most of the householders had large families of three to six persons and came from the overcrowded areas in and around Cairo.

El Amal New Town was visited on 15th March, but there were very few

developments to be considered on the site for the study.

Siwa Oasis had been visited by the author in 1977. During the field study, the author visited the Oasis again on 19th and 20th March. Most of the site observations have been recorded in Chapter 2.

Many authorities who had dealt with the E.N.T. plan in different organisations were interviewed, as follows:

Cairo University

|                  |           |
|------------------|-----------|
| Dr. M. Yosry     | Planner   |
| Dr. B. Bakry     | Architect |
| Dr. H. Sameh     | Architect |
| Dr. A. Sabrey    | Planner   |
| Dr. M. Kassas    | Ecologist |
| Dr. M. El Hadidi | Botanist  |
| Dr M. Monir      | Botanist  |

Alexandria University

|                  |                  |
|------------------|------------------|
| Dr. A. Monir     | Architect        |
| Dr. M. Zahran    | Planner          |
| Dr. M. Hanfi     | Architect        |
| Dr. M. Ayade     | Ecologist        |
| Dr. H. El Laqani | Forestry         |
| Dr. A. Habshi    | Land reclamation |
| Dr. H. El Shimi  | Soil             |

The Architectural Studies Planning Centre (Helopolis, Cairo) was approached and Dr. Abdelbaki Ibrahame was interviewed. Other organisations visited including the Desert Development Centre, Sadat City (Chapter 3), the American University Library, Cairo, and the United Nations Information Centre.

Interviews with authorities, concentrated on the landscape problems and landscape processes of the Egyptian New Towns, as mentioned early in

Chapter 3.4, starting with design and leading to establishment followed by management and maintenance.

The selected site (Chapter 5) was studied by a three-day observation period covering the time from 7.00 am to 8.00 pm. A checklist covering the following points was used:

- Density (the number of people using the open space).
- Age composition of people observed.
- Variations during the week (weekend - weekday).
- Variations during the day according to sun location.
- Activities (activities that people were engaged in when they were observed).
- Location of facilities and its effect on the use of the open space.
- Vehicles (number, location and parking area).

Interviews during the site observations were held with a random sample of residents in different sites of the E.N.T. A checklist covering a wide range of uses of open space was made as follows:

- Satisfaction with appearance of the neighbourhood.
- Satisfaction with the view from their flats.
- The use of open space for sitting out.
- Satisfaction with four-storey flat blocks.
- Use of open space for walking.
- Satisfaction with the safety of open space for a children's playing area.
- Satisfaction with car parking.
- Problems associated with noise caused by children.
- Advantages and disadvantages of open space.
- Suggestions for improving public open space.

## BIBLIOGRAPHY

- Abdelhalim, A., "Transformation in Architecture and Urbanism", The Aga Khan Awards, 1985.
- Abdin, "A Bio-Climatic Approach to House Design for Semi-Desert and Hot Climate with special reference to Egypt", Liverpool Uni., Ph.D., 1982.
- Abu-Lughod, J., "Contemporary relevance of Islamic urban principles", Ekistics 280, Jan./Feb., 1980.
- Adams, R., et al., "Dry lands: man and plants", London, 1978.
- A.D.D.C., "Extension of 15th of May: Main Report", Cairo, 1980, Arabic.
- Al Ahram International, London, 29th September, 1987.
- Al Ahram, "New community, seminar", Al Ahram Newspaper, 14th Nov., 1986.
- Allam, K., "Regional and urban planning of greater Cairo", IFLA Year Book, 1985/86.
- Ardalan, N., "Place of public gathering", The Aga Khan Award for Architecture, 1980.
- Attia, Y., "A new settlement policy for Egypt" Ph.D., University of Liverpool, 1984.
- Ayad, M., "Towards housing policy for Egypt", Liverpool Uni., Ph.D., 1983.
- Ayyad, M., "Ecology: Introductory Notes", Alexandria Uni., 1978.
- Ayyad, M., "Hot Desert of Egypt and Sudan", "Hot Desert and Arid Shrubland", (ed.) Evenari, Amsterdam, 1986.
- Ayyad, M., "The Samedene Project", op.cit, Bishay, 1979.
- Berg, "Drainage Systems and Management", FAO/UNESCO "Irrigation, Drainage and Salinity", London, 1973.
- Bishay, A. (ed.) et al., "Advances in Desert and Arid Land", Schweiz, 1979.
- Blundy, D., "Egypt on the brink", Sunday Times, August 8th, 1988.



- Booth, W., "Basic elements of landscape architecture design", Elsevier P.C., New York, 1983.
- Bruum, B., "Common Birds of Egypt", Cairo, 1985.
- Byrom, J., "Studies of local open spaces in British housing", Ph.D., Edinburgh University, 1976.
- Cairo University, "Protection of 15th of May New City from flood", 1982, Cairo, Arabic.
- China, "Chinese experiment", Sunday Times, July, 1986.
- Chiri, T., "Housing in Egypt - a preliminary overview", Open House International Vol. 10, No. 3, 1985.
- Clouston, B., "Landscape design with plants", London, 1977.
- Cochrane, T. (ed.) et al., "Landscape design for the Middle East", Ali, T. (ed.) et al., London, 1978.
- D.D.C., "Desert Development Centre Report", American University, Cairo, 1985.
- Davidson, F., "Aid and urban development in Egypt", Open House International, Vol. 10, No. 3, 1985.
- Davidson, F., "Ismailia, from master plan to implementation", Third World Planning Review No. 2, May 1981.
- Economist, "Egypt: the riot-stopping riot", The Economist, March 1st 1986.
- El Baki, A., "Enhance the cultural value in the contemporary Islamic city", Arabic, Cairo, 1982.
- El-Sadek, S. (ed.), "The Arab City", Saudi Arabia, 1982.
- Fakhny, A., "The Oases of Egypt", Volume 1, Siwa Oasis, Cairo, 1973.
- Faratat, A., "Urban food-production for a self-reliant desert community in the Middle East", Canada, 1981.
- Fathy, H., "Vernacular architecture: principles and examples with reference to hot arid climates", Chicago, 1986.

- Gillespie, W., "Masterplan Studies for the Suez Canal Region", Landscape Design, May, 1976.
- Godie, A., "The Warm Desert Environment", Cambridge Uni., 1977.
- Golany, G. (ed.) "Urban planning for arid zones", 1970.
- Golany, G. (ed.), "Housing in arid lands", London, 1980.
- Golany, G., "Arid zone settlement site selection the case of Egypt", Ekistics 291, Nov./Dec., 1981.
- Golany, G., "Design for arid regions", New York, 1983.
- Gowers, A. "Egypt, the country's population growth", Financial Times, June 27th, 1988.
- Hakim, B., "Arabic-Islamic cities", London, 1986.
- Hough, M., "City form and natural process", Sydney, 1984.
- Hyland, A. (ed.) et al., Housing in Egypt, Cardo, Newcastle, 1986.
- Ismaila, A., "Origin, ideology and physical patters of Arab urbanisation", Univ. of Karlsruhe, Ph.D., 1969.
- Jahn, G. "The old city: Coptic coexistence", USA International Architect "An introduction to Islamic Cairo", Issue 7, 1985.
- July, R., "A history of the African people", Faber, L., London, 1970.
- Karim, I., "Towards a general plan for Egypt and effect on the landscape of the cities in the Nile Valley", IFLA Year Book, 1985-86.
- Kelly, K., "Landscaping the Saudi Arabian desert", Philadelphia, 1976.
- Khodarie, A., "New Town location in Greater Cairo Region: Towards the determination of factors affecting site selection of new towns", Ph.D., Liverpool University, 1986.
- Konya, A., "Design Primer for Hot Climates", London, 1980.
- Krenz, J., "Landscape for the new housing estates in Gdznsk, Poland", Landscape Design, 6/83.
- Larsen, T., "Siwa: Oasis Extraordinary", ARAMCO WORLD, Vol. 39, No. 5, Sept.-Oct., 1983.

- Laurie, M., "An Introduction to Landscape Architecture", American Elsevier Pub. Co., New York.
- Lecock, R., "Conservation in Islamic Cairo", The Aga Khan Award for Architecture, 1985.
- Letter I, "Egypt, a case of ecological vulnerability", Letter The Conservation Foundation", August, 1983.
- Letter II, "Cairo: a Third World city in growing trouble", Conservation Foundation, September, 1983.
- Lötsch, B., "In search of human measure", Garten + landschaft, 1/84,
- Louw, G., "Ecology of desert organisms", New York, 1982.
- Lynch, K. (Site planning), 3rd Ed., 1984.
- M.H.R., "Suez Canal Regional plan", Cairo, 1976.
- Miller, J., "Design and the desert environment: Landscape architecture and the American Southwest", University of Arizona, 1978.
- Misra, R., "Urbanization and national development: the quest for appropriate human settlement policies in the Arab world", Ekistics 300, May/June, 1983.
- Monir, M., "Sand Dunes in Egypt", Desert Institute, Cairo, 1983 (Arabic).
- Mostafa, S., "The Islamic principal in the design of the courtyard house", Architecture and Planning Studies Centre, Cairo, 1986.
- Moustapha, A., "Islamic values in contemporary urbanism", Albenana, Vo. 7, No. 41, May/Jun., 1988.
- Newton, N., Design on the land, Harvard College, U.S.A., 1971.
- Newton, P., "Planning new towns for harsh arid environments: an evaluation of Shy Gap and Newman mining towns, Australia", Ekistics 11, March/April, 1985.
- Porter, W., "Architecture in Islam: The search for form", The Aga Khan Award for Architecture, 1980.

- Reda, H., "Yanbu Industrial City", Saudi Arabia, 1981.
- Roth, T., "Repercussions of the Asswan Dam", "Gartent Landschaft", Nov./1979.
- Sabbour, "The planning of Sadat City", 1980.
- Said, R., The Geology of Egypt, Elsevier P.C., Amsterdam-New York, 1962.
- Saini, B., "Building environment", Sydney, 1973.
- Sameh, H., "Planning & Architectural Criteria with respect to Climatic Conditions", Report, Cairo, 1987.
- Samworth, J., "Desert new towns", Landscape design, November, 1980.
- Sawyer, "Landscape Studies, An introduction to geomorphology", London, 1970.
- Serageldin, M., "Changing roles and procedures in the design of public building", The Aga Khan Award for Architecture, 1980.
- Shalabi, T., "Housing in Islamic cities", Arabic, Cairo, 1986.
- Sioufi, M., "A Fatimid Harah: its physical, social and economic structure", The Aga Khan Program for Islamic Architecture, Harvard Univ., 1981.
- SWECO, "10th of Ramadan Master Plan" 1976, Cairo, V0-V4.
- SWECO, "Tenth of Ramadan" Growth Plan 1982, Cairo.
- The Economist, "The riot-stoppers riot", March 1st, 1986.
- The Economist, "Year of the Locust, again", The Economist, May 17th, 1986.
- The Welwyn Garden City & Hatfield Development Corporations, "A report on landscaping", 1982.
- Tomes, J., "Cumbernauld New Town landscape", Cumbernauld Development Corporation, 1986.
- Tule, J., "Suez City and region", Gartent & Landschaft, 11/79.
- Turner, T., "Notes on Social Science and Technical Aspects of Environmental Design in Egypt", Cairo, 1975.

- Unterman, R., "Site planning for cluster housing", New York, 1977.
- Walker, T., "Nightmare for Egypt's urban planner", Financial Times, 27/09,85.
- Waller, E., "Landscape planning in Saudi Arabia", Jeddah, Saudi Arabia, 1985.
- Walter, "Ecology of Tropical and Subtropical Vegetation", Shaltart, 1971.
- Wenkmeister, "Opening Remarks", IFLA Year Book, 1985,86.
- Wichens, G. (ed.), Plants for Arid Lands, George Allen & Unwin, London, 1985.
- Winter, R., "New towns: a landscape of opportunity", "Landscape design", 1982, August 14th.
- Zube, E., "A Cultivated Dislike for the Egyptian Desert", Landscape Architecture, Nov./Dec., 1983.